

Final Report

Assessment of Potassium Iodide (KI) Distribution Campaign and Emergency Response Around New Jersey's Nuclear Power Facilities

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Executive Summary

This study utilized mailed surveys of two broad groups, the general public and emergency responders, who might be affected in the unlikely event of an accident or terrorist attack at one of New Jersey's nuclear power plants. The surveys specifically evaluated the potassium iodide (KI) tablet distribution program conducted in the summer of 2002 and also evaluated general emergency response knowledge and needs within the 10 mile Emergency Planning Zones (EPZ) of the two nuclear power facilities in New Jersey. Details are provided in the text of this report and a summary of responses to the survey questions are provided in the Appendices. Appendix B contains overall summaries for the general public and in some cases this data is sorted and presented by EPZ area.

Additional analysis of this data has also been accepted as three separate papers in technical peer reviewed journals (American Journal of Public Health, Public Health Reports, and Health Physics: Operational Radiation Safety Supplement).

Recommendations

- 1) Additional educational materials and outreach, especially those related to general emergency preparedness, should be distributed to communities located inside the 10 mile EPZ areas of the nuclear power plants. Frequent reminders are also needed. This information must be carefully designed to match the education and interest level of the community. Specifically:

General Public

- a) Additional information regarding emergency evacuation routes for the general public and frequent reminders of these routes are needed.
- b) Emergency plans for nuclear incidents need to address the potential for a large number of people evacuating the area prior to an official evacuation order.
- c) The general public needs to have more awareness and a better understanding of the need to go to an official reception center during an evacuation, especially if they are contaminated with radioactive material.
- d) Hospital emergency departments need to be prepared to cope with persons visiting their facility for decontamination and health concerns during an incident. Emergency departments need to be prepared to direct people to official reception centers.
- e) The general public needs a better understanding of the utility of "sheltering in place" and emergency response plans should account for the possibility that the general public will not comply with a "shelter in place" order.

f) News and other publicly available information sources must be able to provide accurate information to the public during an incident.

g) The public needs to be provided with information that increases their awareness of how and where they can find emergency information and who they can contact during an emergency for additional information.

Emergency Responders

h) Additional information regarding the proper chain of command among emergency responders should be more fully communicated.

i) Additional training regarding the handling and treatment of persons exposed to radiation and radioactive materials needs to be provided to medical personnel, including hospitals, primary care personal physicians practicing within the EPZ areas, and school nurses.

- 2) Additional information regarding potassium iodide (KI) prophylaxis should be provided to the general public and emergency responders. Specifically:
- a) Additional information among the general public, health professionals, and emergency responders regarding KI use during pregnancy, KI use among persons over 40 years of age, and the proper KI dosage for children should be provided.
 - b) The proper child dosage should be reinforced among school nurses and a readily accessible reminder, such as a wall magnet or small poster, should be provided to school nurses.
 - c) Health professionals, including primary care physicians, should be made aware of additional training that is available, such as the free 2 credit CME approved online course for health professionals regarding general radiological preparedness and KI prophylaxis available at:
<http://ccoe.umdnc.edu/online/em/08MC13/contents/index.htm>
 - d) Proper dosage reminders and educational materials, such as the NJDHSS KI fact sheet, must be revised to account for the different KI products that are currently available. For example, some local health departments have reported confusion among recent pill recipients because there are several different types of KI pills available. In addition, liquid solutions of KI have also become available recently.
 - e) Emergency departments, private physician offices, and pharmacies should be prepared to direct requests for KI pills during an emergency to

the proper distribution site (e.g. local health department or reception center) or they should retain their own supply. Providing additional information to the community regarding locations to obtain KI pills during an emergency may reduce confusion should KI pills be needed.

f) Simple fact sheets and newspaper articles that are written concisely and in plain language should be encouraged as they are effective means of communicating information to the public.

g) Job training of emergency responders is effective and should be encouraged on a frequent basis, especially since volunteer units may have a high turnover rate among members.

h) Emergency response plans should incorporate an effective method of distributing KI pills during an emergency to the large number of people within the EPZs that have not previously attended a distribution clinic. This plan should be evaluated to determine its effectiveness in a real emergency.

Introduction

Potassium iodide (KI) tablets serve as a secondary protective measure in a nuclear incident that releases radioactive iodine, the third most plentiful isotope in nuclear power reactors, because it prevents the thyroid from absorbing the radioactive iodine. However, KI must be used properly to ensure its effectiveness. On January 19, 2001 the Nuclear Regulatory Commission (NRC) required that states consider the usage of KI tablets as a protective measure in the event of a nuclear incident. In response to the NRC's recommendation to the states, the New Jersey Department of Health and Senior Services (NJDHSS) set up KI distribution clinics in the summer of 2002, where KI tablets were offered to interested persons who lived or worked within 10 miles of the state's two nuclear power facilities. NJDHSS provided educational materials about KI prophylaxis for those individuals attending the distribution clinics in 2002. The NJDHSS will be tasked with future KI distribution campaigns when the currently distributed supply passes its expiration date in March of 2007. There has also recently been some activity regarding the provision of liquid solutions of KI in dosages applicable to children.

In addition to this statewide effort in 2002 and work with the general public, New Jersey has an extensive response program for nuclear power plant emergencies and has highly trained radiation safety professionals in various state agencies. These multiple agencies, as well as the power companies themselves, participate in a planning group that meets quarterly to assure effective communication. The planning group is called the Radiation Emergency Response Planning (RERP) group and includes representatives from the New Jersey State Police Office of Emergency Management, the New Jersey Department of Environmental Protection Bureau of Nuclear Engineering (NJDEP BNE), the NJDHSS Office of Emergency Operations, the Office of Emergency Management for each of the local municipalities and counties that hosts the two nuclear facilities, representatives from the power companies, and representatives from the local and county health departments. RERP provides coordination of nuclear emergency response planning efforts and its members are considered experts in the field. The NJDEP BNE provides training to local emergency first responders on a regular basis, which includes some discussion about KI prophylaxis.

The objective of this project was to evaluate the KI distribution campaign of 2002 and to evaluate emergency preparedness issues among the general public and among emergency responders.

Methods

This project utilized two different written surveys, one designed for the general public and one designed for emergency responders. Both surveys were assessed for face and content validity and pilot tested before use. Members of the general public are those persons who live or work within the Emergency Planning Zone (EPZ) of either Oyster Creek Nuclear Generating Station or Salem/Hope Creek Nuclear Generating Station. The EPZ encompasses an area that is approximately a 10 mile radius around each nuclear power plant. Emergency Responders were broadly defined to include firemen, police,

hazardous materials technicians, and health care providers (including school nurses, physicians, pharmacists, local health officers) that service areas within the EPZs.

General Public Survey

The General Public survey was validated and pilot tested before use. This survey was developed to determine the effectiveness of education and outreach provided to residents attending the KI distribution clinics. In addition, general baseline knowledge of emergency preparedness and anticipated behaviors among survey respondents in the event of a nuclear power plant emergency were also assessed. The finalized survey was sent to 1,566 residents living within the EPZs. The enrollment period of the survey was open from February 2005 to November 2005, roughly 3 years after the state-sponsored KI distribution clinics. Survey respondents were asked to take the survey on their own and not to use or refer to any written material when taking the survey. Of the total survey sample, 741 surveys (i.e. 47% or 741/1566) were sent to persons known to have attended a state-sponsored KI distribution clinic in the summer of 2002. They were identified through a search of informed consent documents signed by KI pill recipients at the distribution clinic. Another 825 surveys were sent (i.e. 53% or 825/1566) to persons who live in the EPZ area and for whom we had no record of their attendance at a distribution clinic. In the mailed survey, we asked survey respondents if they attended a state-sponsored distribution clinic and if they had obtained KI pills to definitively assure that we correctly classified survey respondents into the correct sub-grouping, KI pill recipient versus people never getting KI pills. Surveys that were returned because they were undeliverable by the US Postal Service (USPS) were replaced with another potentially eligible address. For those surveys that were delivered by the USPS, reminder post-cards and repeat mailings were sent to those who did not return a survey within a specified time frame. Monetary incentives, in the form of a \$10 Wal-Mart gift card, were promised and delivered to those who returned a completed survey.

Emergency Responder Survey

The Emergency Responder survey was developed, validated, and pilot tested to determine the baseline knowledge and beliefs about emergency response and KI prophylaxis among emergency responders (fire, police, HazMat) and health professionals. This written survey was distributed to emergency response units and health professionals within the EPZs of New Jersey's two nuclear power plants. Several sources of information were used to identify emergency responders and health professionals within the EPZs, including mailing lists from the Public Employees Occupational Safety and Health (PEOSH) program, the NJ State Police emergency management program, internet searches, local phone book yellow pages, and the Dun and Bradstreet iMarket database. The lists were compiled and de-duplicated to arrive at a mailing list of emergency response units and health professionals within the EPZ of NJ's two nuclear power plants. Health professionals were easily identified and were mailed one survey each. Individual emergency responders could only be identified through their response unit since many of these individuals are part of a local fire company (volunteer or paid) or local police force. A point of contact (POC), often a fire or police chief, was

determined through phone calls to each emergency response unit (i.e. fire, police, HazMat) and this POC was asked to complete a survey and also distribute the voluntary survey to five of their staff. The POC was asked to distribute enclosed packets that contained the survey, informed consent form, a narrative description of the study, and a self addressed stamped envelop. Respondents were asked to return the survey directly to the NJDHSS if they chose to participate in this voluntary survey.

Survey packets were mailed to 91 fire, police, and HazMat units and to 116 health professionals. A \$10 Wal-Mart gift card was used as an incentive and reminder post-cards were mailed to all response units and medical professionals as a means of encouraging completion and return of the survey. The enrollment period of the survey was from March 2005 to November 2005.

Results

The General Public Survey questions, Emergency Responder Survey questions, and the raw data summarized in histogram plots are contained in the Appendices. The key points observed are detailed below.

General Public

The repeat mailings and reminders plus the incentive resulted in the return of 729 General Public surveys, which was a 49% response rate among this population of residents living within the EPZ areas of New Jersey's nuclear power plants. Of the 729 returned surveys, 421 survey respondents had obtained a KI pill, 286 survey respondents had never obtained a KI pill and 22 respondents either couldn't remember if they obtained a KI pill or did not respond to the question in the survey asking if they had ever obtained KI pills. The demographic characteristics of our General Public survey respondents indicated that 85% were over 40 years of age, 54% were female, 93% were white non-Hispanic race/ethnicity, and 99% spoke English as a primary language in their home.

The survey data demonstrated that the general public's knowledge of emergency preparedness issues outside the subject area of KI tablets was lacking, with 52% of our sample (380/729) actively indicating that they did not know their emergency evacuation route and did not know how to find information on the correct route. Less than 25% of our sample (107/729) knew that emergency information was posted inside their phone book and only 35% of Salem county residents knew the information was also posted in a free calendar given out by the power companies. The behavior-based questions demonstrated that 85% of our sample (618/729) indicated that they would evacuate their home if they were told to so by a government agency or the police. The graph on page 25 in Appendix B show other likely behaviors of the survey respondents if there were a major accident at the nuclear power plant. Greater than 75% of the respondents indicated that they would listen to the radio or watch TV and 53% of the respondents indicated they would drive away as far as possible. It is interesting to note that a higher percentage of people would drive as far away as possible (53%) versus driving to an emergency shelter (31%). The graph on page 26 in Appendix B show survey respondents' answers about their likely behaviors if they thought they were exposed to radiation or radioactive

materials from a nuclear power plant release. A significant majority of survey respondents indicated that they would go to their local hospital emergency department (63%) or call/visit their personal doctor (59%). A smaller percentage, 44%, of survey respondents said they would likely go to an emergency reception center.

In terms of knowledge regarding KI tablet usage, there was a statistically significant difference between persons who received KI pills and those who had not received KI pills. Most of the KI pill recipients attended a KI distribution clinic and therefore received some educational materials with their KI pills. KI pill recipients had a statistically significant higher percentage of survey respondents selecting correct answers to knowledge based questions regarding the use of KI when compared to the non-KI recipients based on a chi square analysis. For some questions, such as the question about the proper adult dosage, the difference between the two groups was dramatic, with 72% of the KI pill recipients selecting the correct answer versus only 13% of the non-KI recipients selecting the correct answer. In addition, 95% (401/421) of the survey respondents that had received pills at the clinic reported that they knew where they had stored their pills, only 4% (16/421) indicated they did not know where they put their pills, and less than 1% (2/421) reported that they had already taken their pills. This pill retention rate was high, even though the distribution clinic had been held approximately two and half years before this mailed survey was completed.

Emergency Responders

At least one survey was returned from 62 emergency response units, resulting in a 68% return rate for emergency response units contacted. In total, 160 individual emergency responders returned a survey; of these 65 were police officers, 65 were fire fighters, 12 were Hazardous Materials Technicians, 14 reported they have no role during an emergency, and 4 respondents provided answers that were unclear regarding their role. A total of 116 surveys were mailed to individual health professionals and 44 of those surveys were returned, a response rate of 38%. Almost half of our health profession respondents were school nurses (20 of 44). There were a total of 204 survey respondents for all groups combined. The demographic data indicates that there are some similarities and differences among the emergency response and health professional groups surveyed in this study. For all respondent groups, the most prevalent age range was 40 - 64 years of age. Fire and HazMat units had a number of survey respondents above 65 years of age, 14% and 17% respectively. This was likely due to the voluntary nature of some fire companies and some HazMat units, which allow retired persons to be part of their unit. All survey respondents essentially were non-Hispanic, white English speaking people, with emergency responders (police, fire, HazMat) almost exclusively male (>89%) and health professionals being a more mixed gender group (57% female and 43% male). Education also varied among the different respondents, with only about 30% of emergency responders versus over 90% of health professional survey respondents having had some formal scientific training and the health professional group being more highly educated overall. The HazMat, police, and health professional groupings all roughly had household incomes above the NJ state median of \$50K per year, while the fire group had only 54% of their respondents with household incomes above the state median.

This survey found that 64% of emergency responders (fire 26%, police 34%, HazMat 4%) who indicated they have a role during a nuclear incident did not feel that they have enough safety equipment to protect themselves when responding to a radiological emergency and that 32% of these respondents were not familiar with emergency response plans for the nuclear power plants in their jurisdiction. In addition, 46% of the fire, police, and HazMat survey respondents who indicated they have a role during a nuclear power plant emergency indicated that the State Office of Emergency Management was lead agency for dealing with off site releases from a nuclear power plant during an emergency. The other 54% of fire, police, and HazMat survey respondents indicated another agency or multiple agencies as the lead for dealing with off site releases from a nuclear power plant during an emergency.

Questions regarding KI use during pregnancy, use among persons over 40 years of age, and the proper childhood dosage were questions with the lowest correct responses among all survey respondent groups, but particularly for police, fire, and HazMat emergency responders. The graph on page 61 in Appendix D demonstrates the variability among different types of professionals with regards to the proper KI dosage for children, with only 31% of all survey respondents correctly selecting the proper dosage. Health professionals had the highest percentage of respondents with the correct answer (59%), which is crucial since school nurses are a major component of the health professional group. It should be noted that 40% of surveyed school nurses did not know the correct KI dosage for children.

Conclusions

General Public

The data indicate that a distribution clinic where the recipient can meet health professionals, ask questions, and get written educational materials resulted in a higher knowledge of proper KI usage when compared to persons who did not attend a clinic. The demographic information collected indicated that both groups were fairly similar in age and education level, but the KI pill recipients had a slightly higher percentage of females (58% vs. 48%) and was slightly more wealthy (51% vs. 40% greater the \$50K per year). The KI pill recipients had read more about KI pills compared to the non-recipients (79% vs. 21%), with the chief difference being the educational materials given out at the KI clinic. Approximately 21% of both groups had read information in the local newspaper. It is important to note that people who attended a distribution clinic are essentially a self-selected group because the clinics were voluntary. Therefore, attendees of the distribution clinics, and hence the KI pill recipient group, were likely more interested in KI prophylaxis and aware of their local nuclear power plants than the background population. This may have impacted their knowledge of KI use, retention of pills obtained from the clinics, and continued interest in the KI program.

The data indicate that the personal contact with our self selected population of KI pill recipients who attended the KI distribution clinic was effective at increasing awareness among this population regarding proper KI usage. However, knowledge regarding KI use during pregnancy, for people over the age of 40, and the proper child

dosage needs further attention. It also appears that additional educational outreach regarding general emergency preparedness issues is warranted.

Emergency Responders

The higher education and specific medical education among the health professionals group may explain some of the differences in the comprehension of proper KI usage. However, certain questions (KI use over 40, pregnancy, and child dosage) seemed to have poor performance among all groups, which indicates the need to clarify those specific points among emergency responders and health professionals. Specifically, school nurses need further education and outreach regarding the proper childhood KI dosage.

In addition, further assessment of personal protective equipment (PPE) needs and proper communication (i.e. chain of command) needs to be more clearly defined among emergency responders. The question regarding the lead agency for off site releases was pilot tested and validated before use, and therefore the result is not an artifact of survey design. Some uncertainty in response to this question may be due to the case-by-case basis for each potential scenario that could occur at a nuclear power plant, which is demonstrated by the variability in the responses given by emergency responders on this specific survey question. This data suggests that case-by-case determination of authority during an incident may result in confusion regarding authority among emergency responders during an off site release. This may have been rectified by the recent National Incident Management System (NIMS) training provided after the completion of this study. A further evaluation of the communication and authority issue would be useful to determine if NIMS training clarified roles and authority for off site nuclear releases. In addition, this data has shown that health professionals and emergency departments at hospitals need to be prepared to direct patients to reception centers during an incident.

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Appendix A
General Pubic Survey Questions

Public Safety and Health Survey

CONFIDENTIAL!

All information you provide will be kept strictly confidential and analysis will be conducted in a manner that assures your answers will remain anonymous. This survey will be destroyed after this study is completed.

Thank you for your assistance in helping us better serve you.

INSTRUCTIONS:

- ☐ Estimated COMPLETION TIME: 5 - 10 min.
- ☐ Please complete the survey at your earliest convenience.
- ☐ Please take this survey on your own. Please do not use any written materials (e.g. text books, fact sheets, internet searches, etc.) to take this survey.
- ☐ We are trying to improve educational materials regarding nuclear power plant emergencies.
- ☐ Please return in the SELF-ADDRESSED, POSTAGE-PAID ENVELOPE.

- ☐ For questions, please call 1-800-862-4550 or (609)631-4938 or E-mail: ki@doh.state.nj.us

Thank you!

Conducted by:

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Part 1 – General Emergency Preparedness

1. Is there a nuclear power plant within 10 – 15 miles of your home?

- ☐ Yes
- ☐ No
- ☐ Don't know

2. Do you know your emergency evacuation route in the unlikely event that a major accident occurs at a nuclear power plant?

- ☐ Yes

If yes, please describe the route _____

- ☐ No

If no, where do you think you could find the information

3. Would you evacuate your home if told to do so by a government agency or the police because of a major accident at a nuclear power plant?

- ☐ Yes
- ☐ No. *If not, why?:* _____
- ☐ Maybe, not sure

4. If you heard that there was a major accident at a nuclear power plant, please rate the likelihood that you would.....

- | | | | |
|--|--------------------------------------|--------------------------------|-------------------------------------|
| Listen to the Radio | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Watch the news on TV | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Listen for a public emergency announcement | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Drive as far away as possible | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Drive to an emergency shelter | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Seek shelter in your basement | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Call 911 | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Call health department | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Call the NJ Dept. Environmental Protection (NJDEP) | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |

Other - *Please specify anything else that you would likely do:*

5. If you thought you were exposed to radiation or radioactive materials as a result of a nuclear power plant accident, please rate the likelihood that you would...

- | | | | |
|-------------------------------------|--------------------------------------|--------------------------------|-------------------------------------|
| Call or visit your personal doctor | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Call the health department | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Call the poison control center | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Call 911 | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Go to the nearest emergency room | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |
| Go to an emergency reception center | <input type="checkbox"/> very likely | <input type="checkbox"/> maybe | <input type="checkbox"/> not likely |

Other - *Please specify anything else that you would likely do:*

6. Are emergency information and instructions about what you should do in the event of an accident at a nuclear power plant provided in:

- | | | | |
|--|------------------------------|-----------------------------|-----------------------------------|
| Your phone book | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not sure |
| Free calendars mailed by electric company | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not sure |
| Your electric bill | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not sure |
| Newspaper | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not sure |

7. What do you think are the most effective ways for the New Jersey Department of Health and the New Jersey Department of Environmental Protection to provide additional information to people about emergency preparedness? (select the best two choices)

- ☐ Written materials (e.g., booklets, brochures, fact sheets, newsletters)
- ☐ Group meetings
- ☐ Both written materials and group meetings
- ☐ Media (newspapers, radio announcements)
- ☐ TV programs / public service announcements
- ☐ Place information in phone book
- ☐ Free Calendar containing information on inside cover
- ☐ Internet
- ☐ Other- *Please specify:*

- ☐ Don't know

8. If you would like to provide us with any other comments please do so below:

Part 2 – General KI Information

Please check the appropriate boxes.

9. Have you ever heard of:

- | | | | |
|--------------------------------------|------------------------------|-----------------------------|-----------------------------------|
| a. Potassium iodide pills or tablets | <input type="checkbox"/> yes | <input type="checkbox"/> no | <input type="checkbox"/> not sure |
| b. KI pills or tablets | <input type="checkbox"/> yes | <input type="checkbox"/> no | <input type="checkbox"/> not sure |
| c. Anti-radiation pills or tablets | <input type="checkbox"/> yes | <input type="checkbox"/> no | <input type="checkbox"/> not sure |

For the rest of this survey, we will use “KI ” to reference “potassium iodide pills or tablets” or “KI pills or tablets.”

10. From which of the following sources have you received any information about KI (check all that apply)?

- ☐ I have not received any information about KI
- ☐ As part of job training
- ☐ Television
- ☐ Newspapers
- ☐ Information given out at a KI distribution clinic
- ☐ Personal health-care provider (e.g., doctor, nurse practitioner, physician assistant, pharmacist, chiropractor, etc.)
- ☐ Friend, neighbor, acquaintance, etc.
- ☐ Internet
- ☐ Radio
- ☐ Other (*please briefly describe the source*):

11. Have you obtained a supply of KI pills or tablets?

- ☐ Yes
- ☐ No
- ☐ Don't remember

12. What have you done with your KI pills or tablets?

- ☐ I have never gotten any KI pills or tablets
- ☐ Stored them in my home or at work
- ☐ Already taken the pills or tablets
- ☐ Don't know/ don't remember

13. Where did you get your KI pills or tablets? (Check all that apply)

- ☐ I have never gotten any KI pills or tablets
- ☐ At one of the KI distribution clinics held in the Summer of 2002
- ☐ From work or my employer
- ☐ Pharmacy
- ☐ On-line pharmacy or internet site
- ☐ Health Food Store
- ☐ Other *Please specify:* _____
- ☐ Don't know / Don't remember

14. Have you read any information or instructions about KI tablets?

- ☐ Yes
- ☐ No
- ☐ Don't remember if I read information or instructions provided
- ☐ I do not remember receiving any information or instructions

15. Have you read the New Jersey Department of Health Fact Sheet on KI ?

- ☐ Yes
- ☐ No
- ☐ Don't know / Don't remember

16. If you did not read any information about KI, please tell us why. Check all answers that apply to you.

- ☐ I never received any information or instructions
 - ☐ I was too busy
 - ☐ The materials got lost
 - ☐ The information was too technical
 - ☐ The information took too long to read
 - ☐ English is not my first language
 - ☐ Another factor - *Please specify:* _____
-

Part 3 - KI Use

Each of the following questions has only one answer. If you find that you do not know an answer, please do not guess. Just indicate, 'Don't know'. Please answer these questions on your own and do not use any written materials (textbooks, internet searches, etc.) to answer these questions.

Note that “KI” means “potassium iodide pills or tablets” or “KI pills or tablets”.

| | <u>True</u> | <u>False</u> | <u>Don't know</u> |
|---|--------------------------|--------------------------|--------------------------|
| 17. Radioactive iodine is present during all radiation emergencies, including “dirty bombs”. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. KI pills provide protection from all types of radiation. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. In general, pregnant women may safely take a KI pill. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Persons who have had or currently have thyroid disease should ask their doctor before taking a KI pill. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. Persons allergic to iodine can safely take a KI pill. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. In general, persons above the age of 40 should take KI if they are exposed to a very small amount of radioactive iodine. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Reminder, “KI” means “potassium iodide pills or tablets” or “KI pills or tablets”.

23. KI pills or tablets protect “_____”.

- ☐ the whole body
- ☐ the brain only
- ☐ the thyroid only
- ☐ don't know

24. When should someone take their first dose of a KI pill or tablet?

- ☐ As soon as KI pills are received or purchased, regardless of exposure to accidental releases of radioactive material from nuclear power plants
- ☐ Within hours before or after exposure to accidental releases of radioactive material from nuclear power plants
- ☐ Only if they feel sick after exposure to accidental releases of radioactive material from nuclear power plants
- ☐ Don't know

25. What is the recommended KI dose for adults? (note: 1 tablet = 130 milligrams)

- ☐ ½ of a tablet
- ☐ One full tablet
- ☐ Two full tablets
- ☐ Don't know

26. What is the recommended KI dose for children over 3 years old?

- ☐ ½ of adult dose
- ☐ Same as adult dose
- ☐ 2 times the adult dose
- ☐ Don't know

27. How long does effective protection last for a single dose of KI?

- ☐ 24 hours
- ☐ One full month
- ☐ One full year
- ☐ A lifetime

- ☐ Don't know

28. Would taking several doses of KI at one time provide more immediate protection than just one dose?

- ☐ Yes
- ☐ No
- ☐ Don't know

29. If you lived in a home located within 10 miles of a nuclear power plant and heard that the nuclear power plant had a significant accident, would you take a KI pill or tablet regardless of an official announcement from a government agency or the police?

- ☐ Yes, definitely.
- ☐ Maybe.
- ☐ No, I would wait to hear an official government announcement telling me to take the pill or tablet.
- ☐ Don't know

30. Where could someone without KI tablets or pills get KI during an emergency? (check all that apply)

- ☐ Reception center
- ☐ Health Food Store
- ☐ Local Health Department
- ☐ Internet on-line order
- ☐ Supermarket
- ☐ Pharmacy
- ☐ Personal Doctor
- ☐ Hospital Emergency Room
- ☐ Other, please specify: _____

- ☐ Don't know

Part 4 – About You

The following questions will help us describe the group that answered the questionnaire. All your answers on this questionnaire are kept strictly confidential.

31. What is your age?

- ☐ Under 25
- ☐ 25-39
- ☐ 40-64
- ☐ 65 or older

32. What is your gender?

- ☐ Male
- ☐ Female

33. What is your race? You may choose all options that best describe your race.

- ☐ Alaska Native or American Indian
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ White
- ☐ Another race - *please specify:* _____

34. What is your ethnic background?

- ☐ Hispanic
- ☐ Non-Hispanic

35. What is the primary language that you speak at home?

- ☐ English
- ☐ Spanish
- ☐ Other; please specify: _____

36. How much school have you completed?

- ☐ Did not attend school beyond 8th grade
- ☐ 9th-11th grade
- ☐ Graduated High School or GED
- ☐ Technical School
- ☐ Some College
- ☐ Graduated college
- ☐ Advanced degree (e.g., Masters, Doctorate)

37. Have you completed college level classes in engineering or science (such as chemistry, physics, biology)?

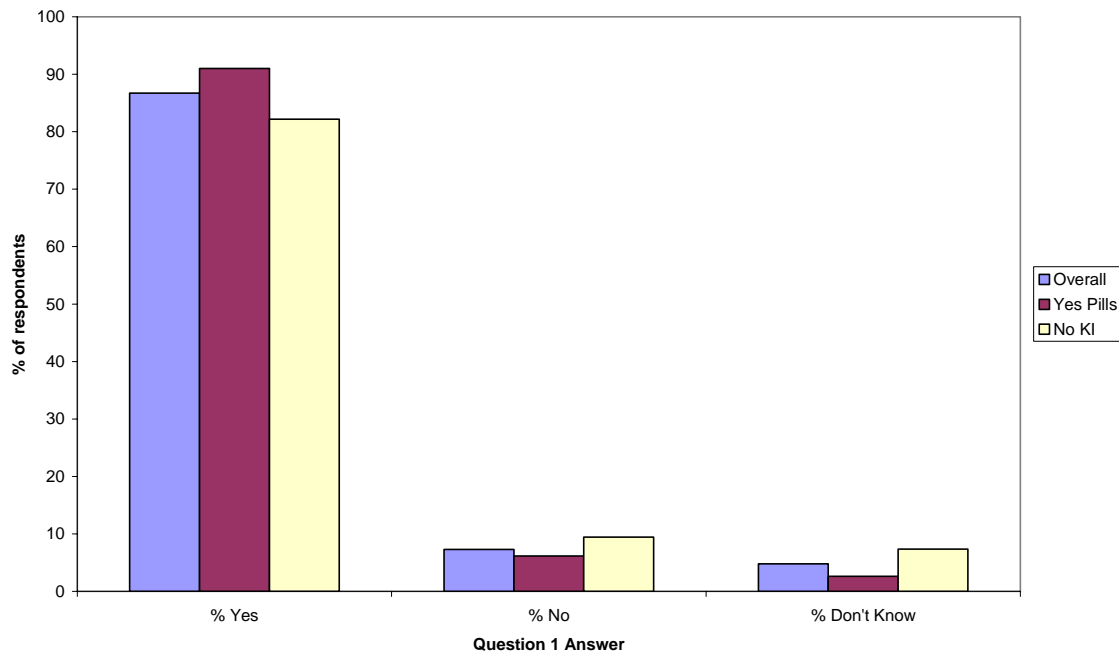
☐yes ☐no

38. Approximately what is your household income bracket?

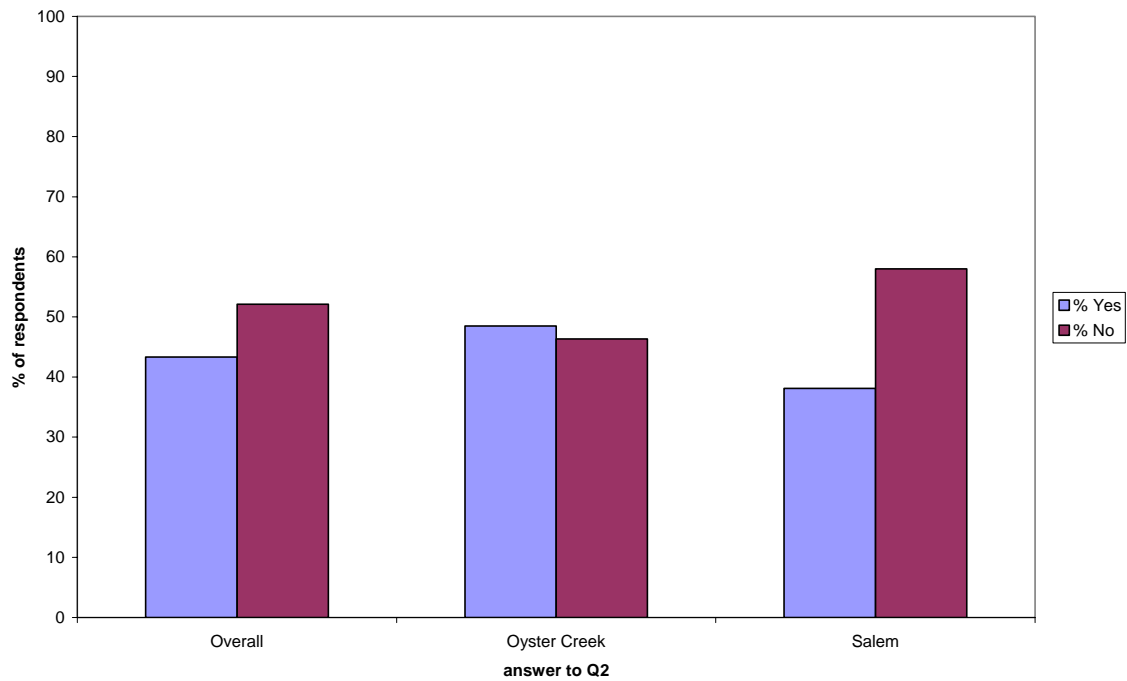
- ☐ Less than \$50,000 per year
- ☐ Greater than \$50,000 per year

Appendix B
Summary of Responses to General Public Survey
Questions

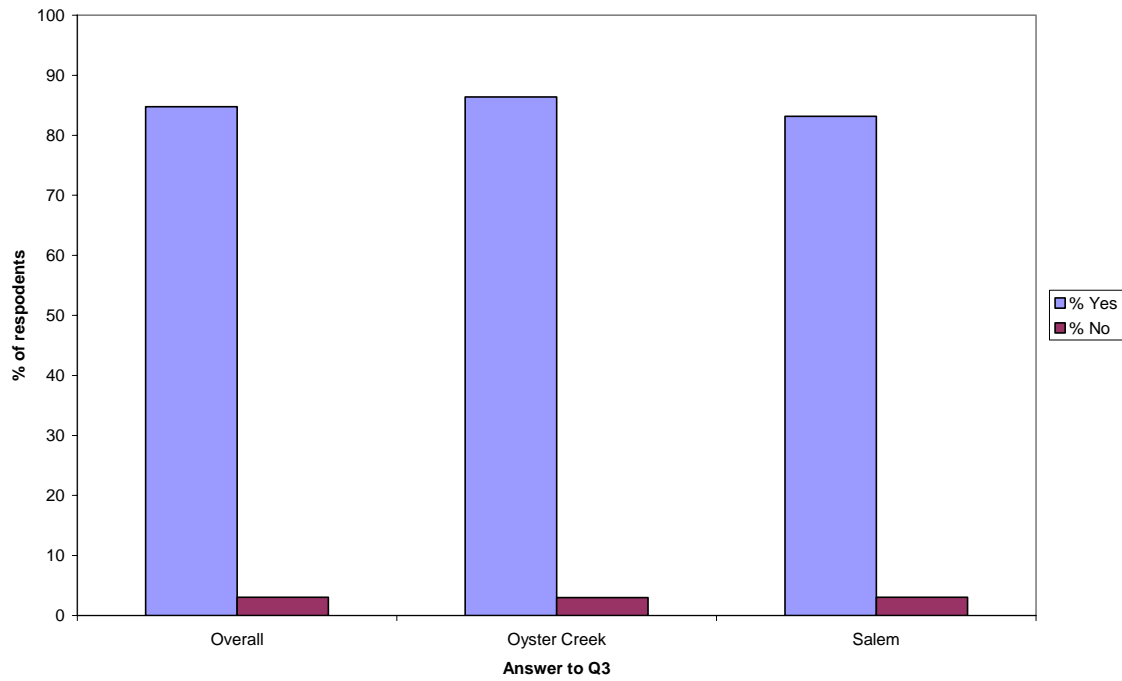
Q1 - Is there a nuclear power plant within 10 - 15 miles of your home? (n = 729 overall; 421 Yes pills; 286 no KI)



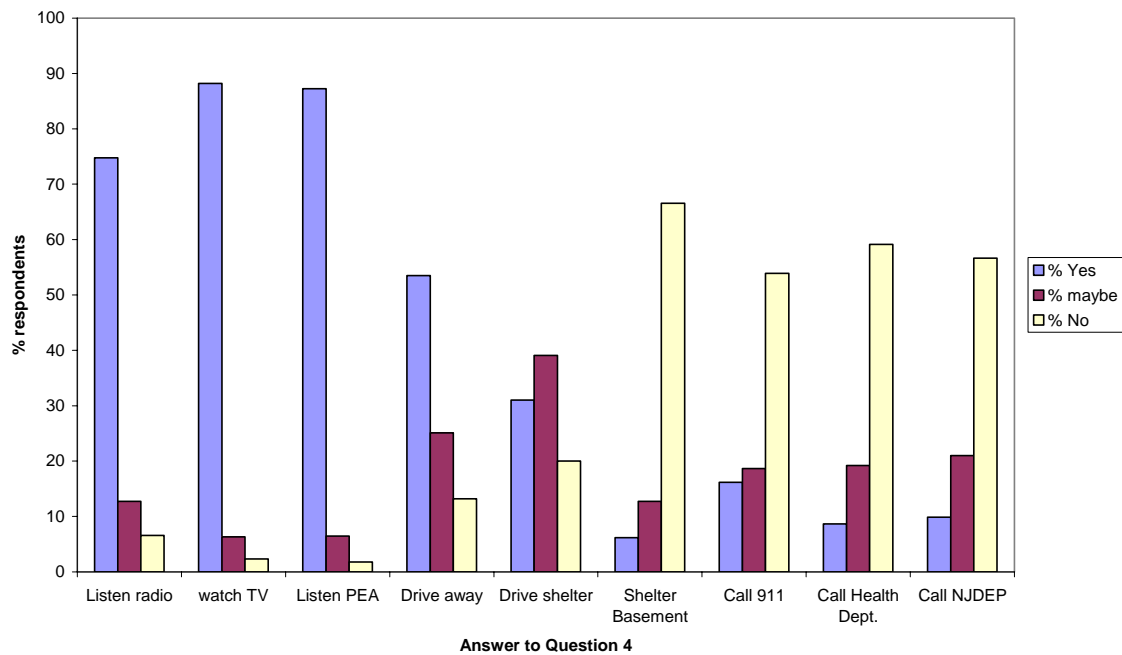
Q2 - Do you know your emergency evacuation route?



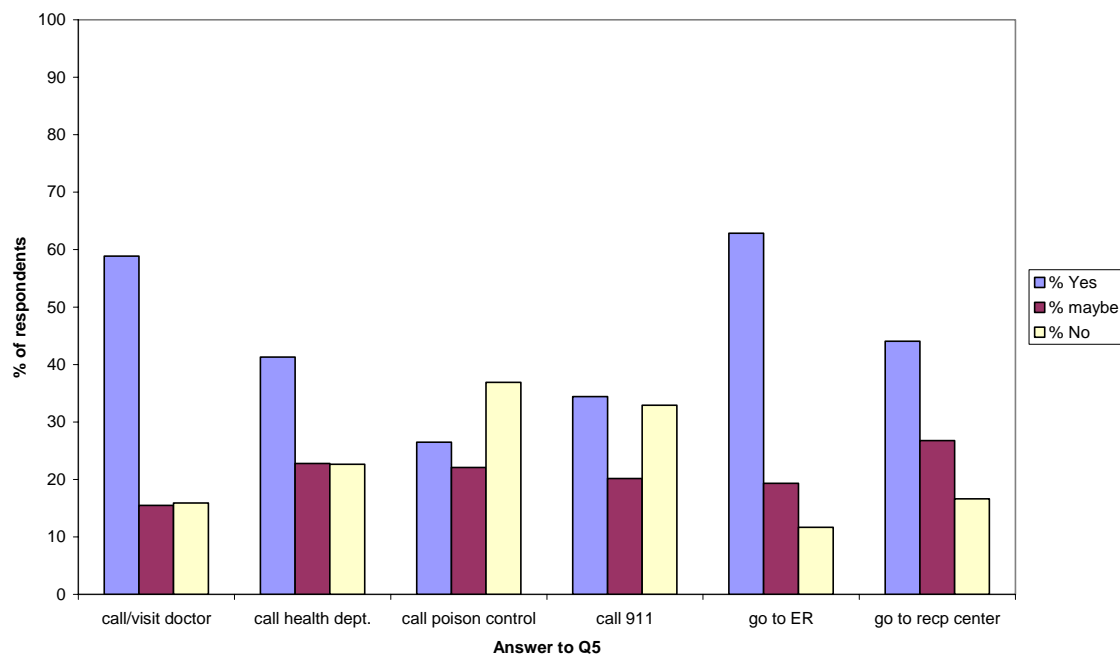
Q3 - Would you evacuate if told to do so?



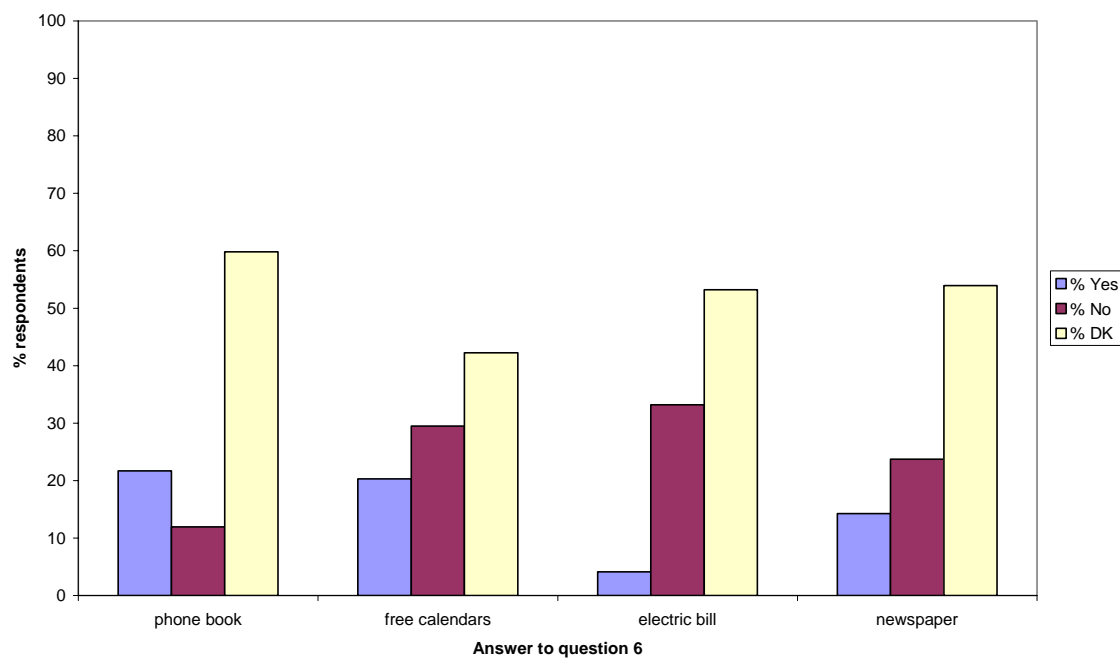
Q4 - (overall group) If you heard there was a major accident at a nuclear power plant, please rate the likelihood that you would.....



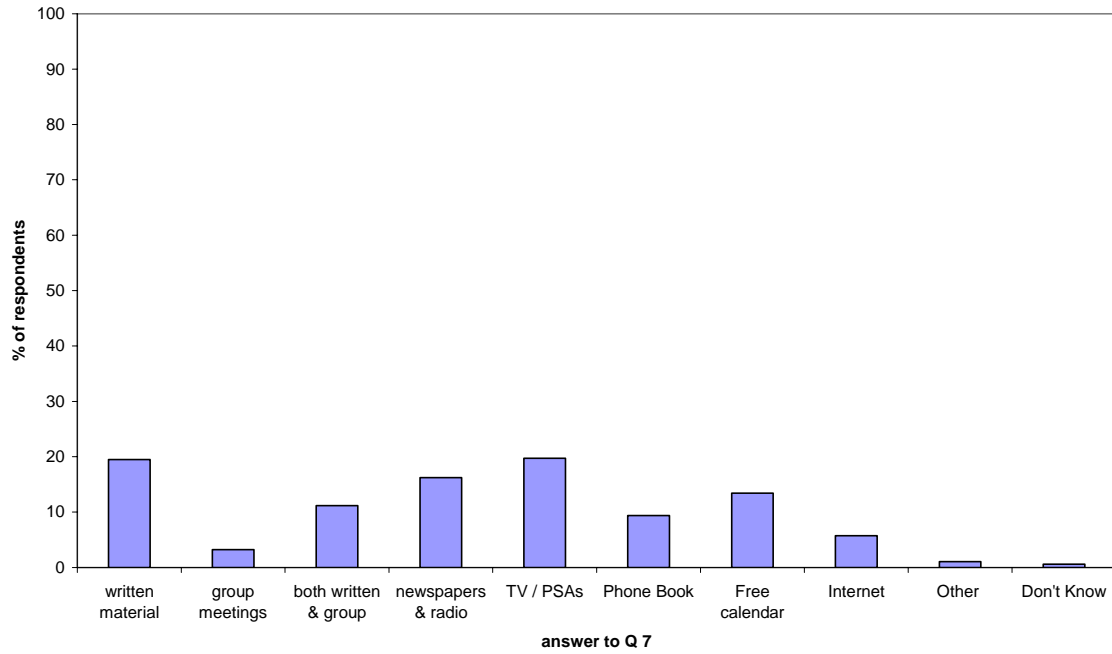
Q5 - (overall grouping) If you were exposed to radiation or radioactive materials, please rate the likelihood that you would.....



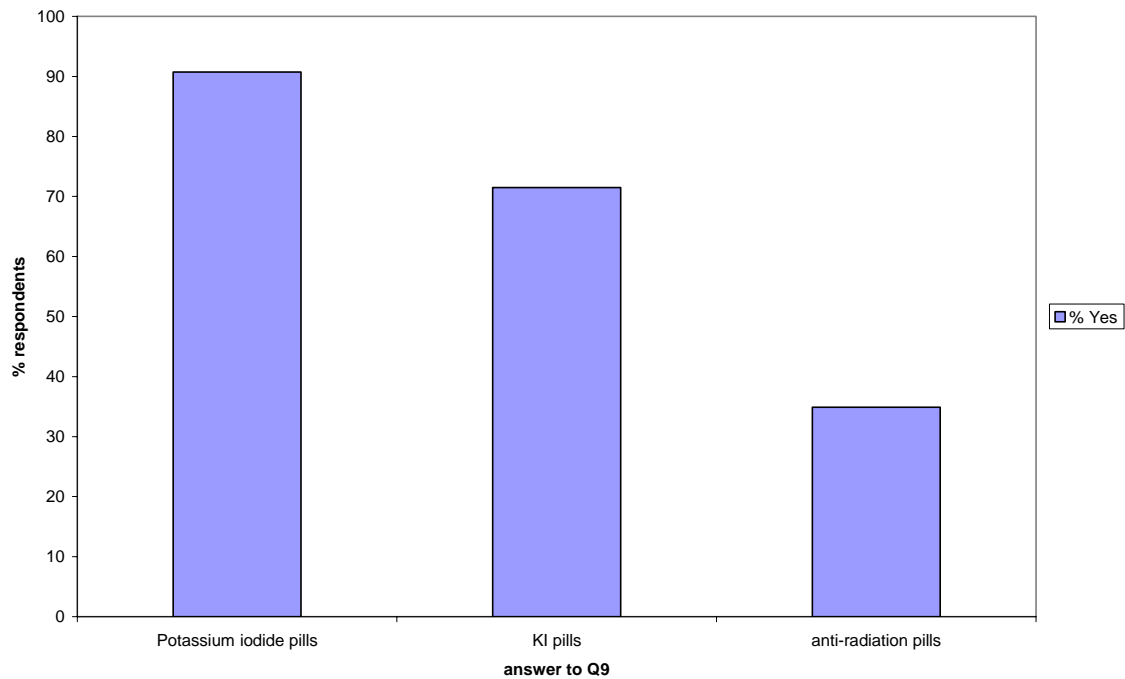
Q6 - (overall grouping) Where is emergency info posted? (note correct answer is phone book & free calendars only)



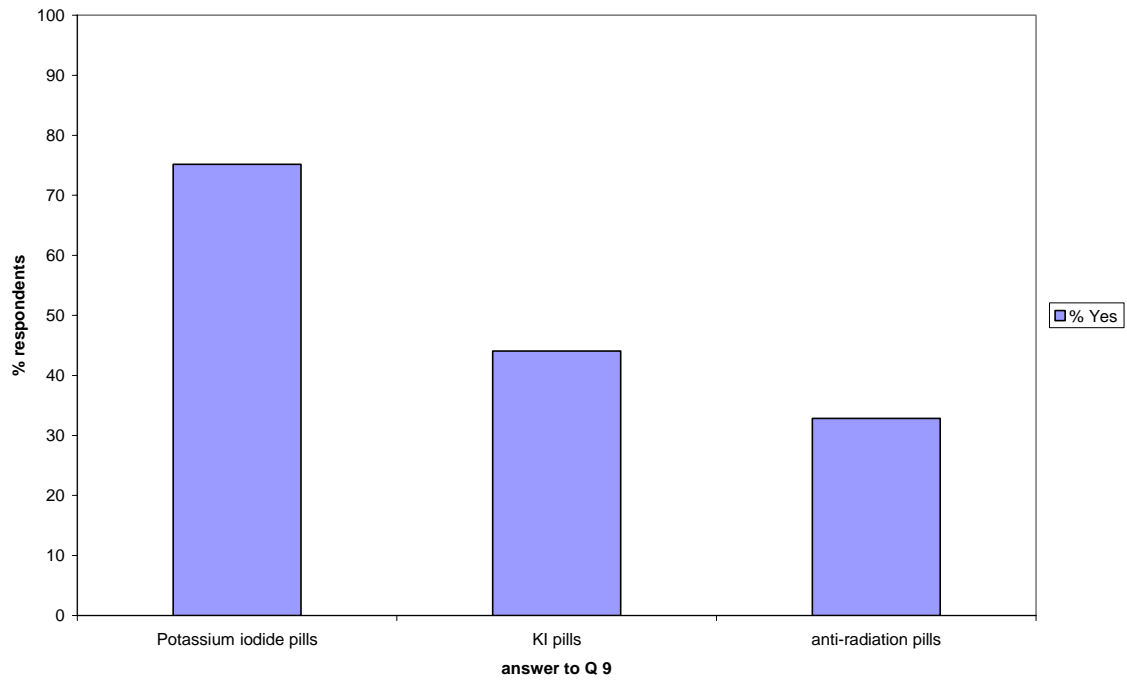
Q7 (overall grouping only) What are the most effective ways for NJDHSS/NJDEP to communicate to you?



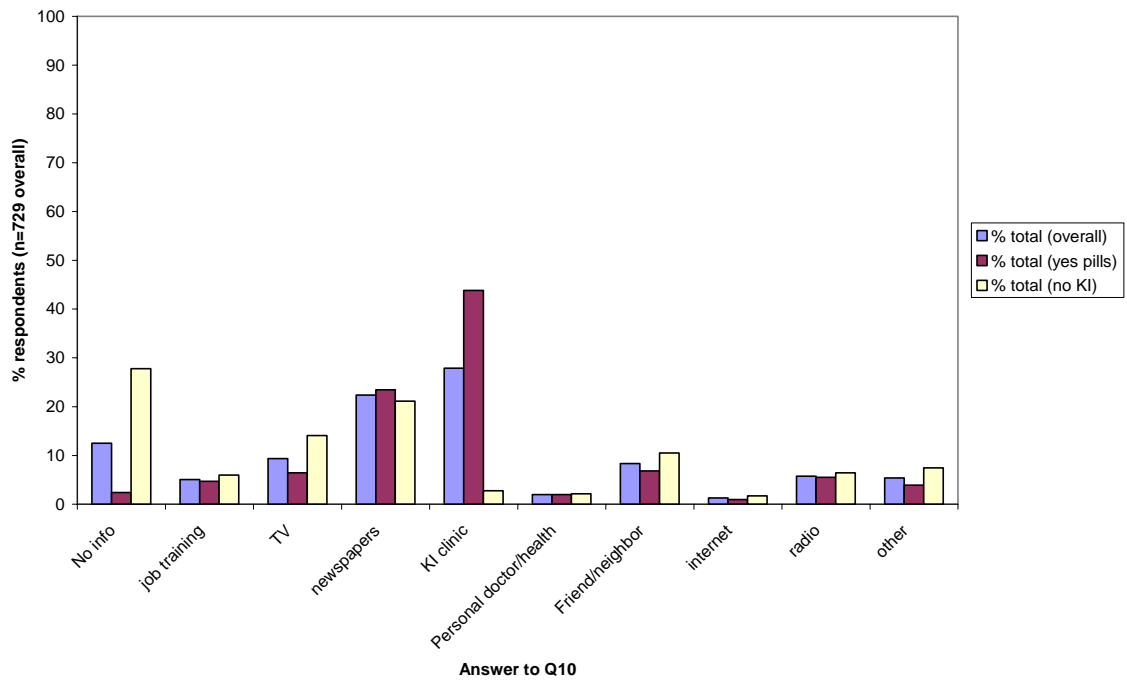
Q9b (KI pill recipients) Have you ever heard of ?



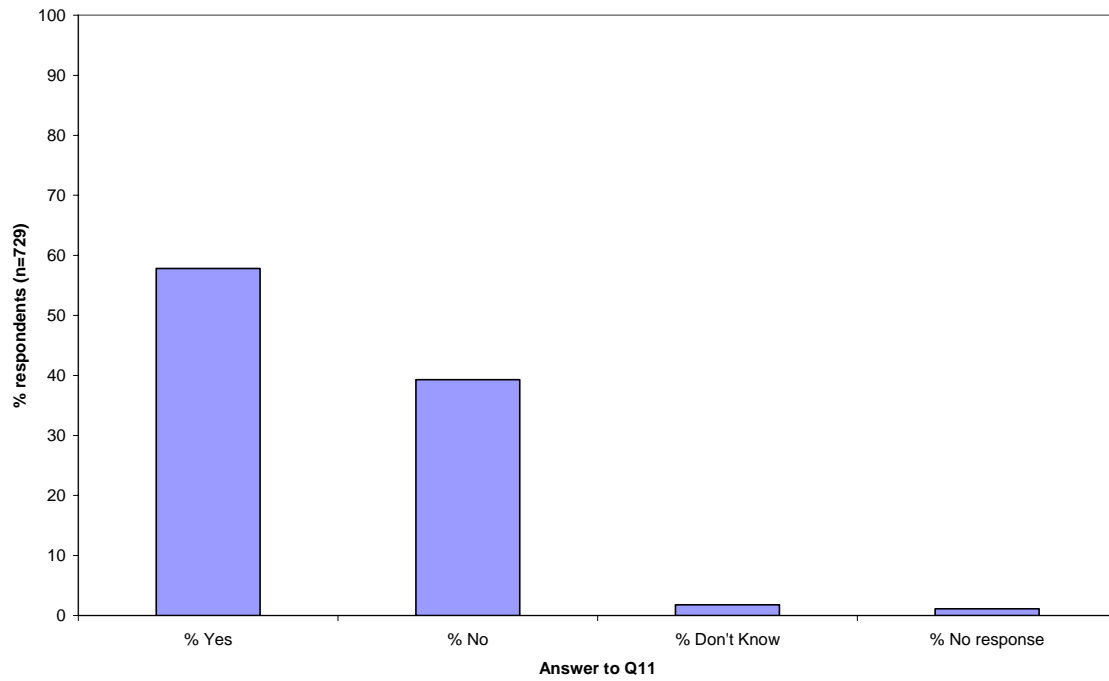
Q9 (non KI recipients) Have you ever heard of?



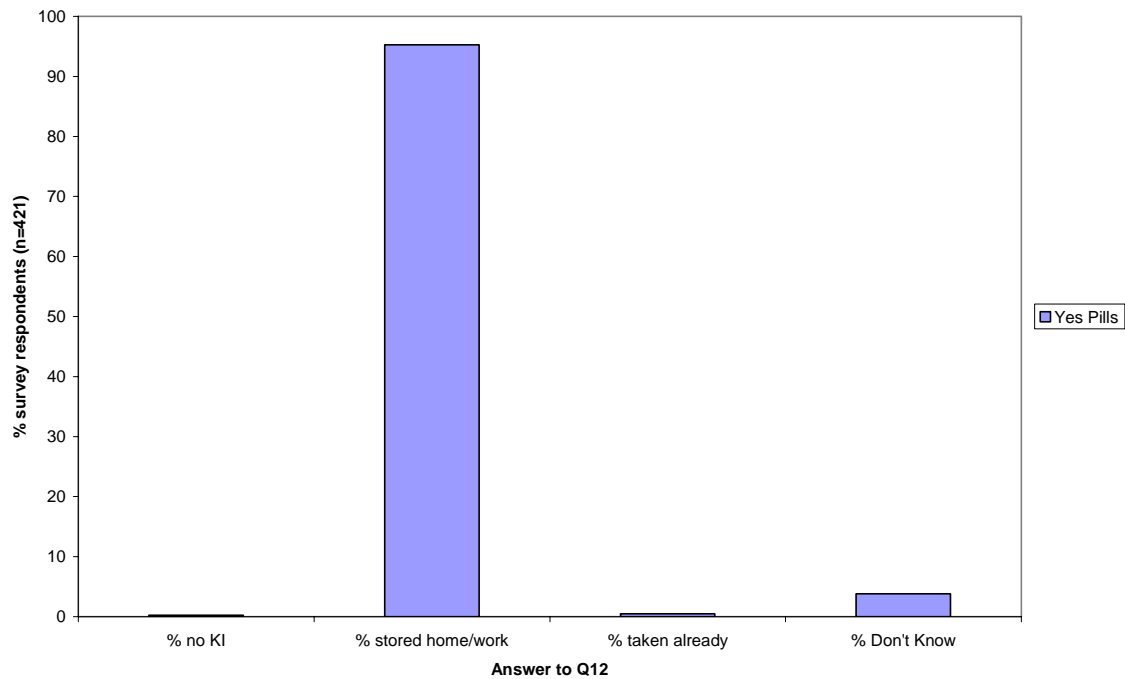
Q10 - From which of the following sources have you gotten any information about KI?



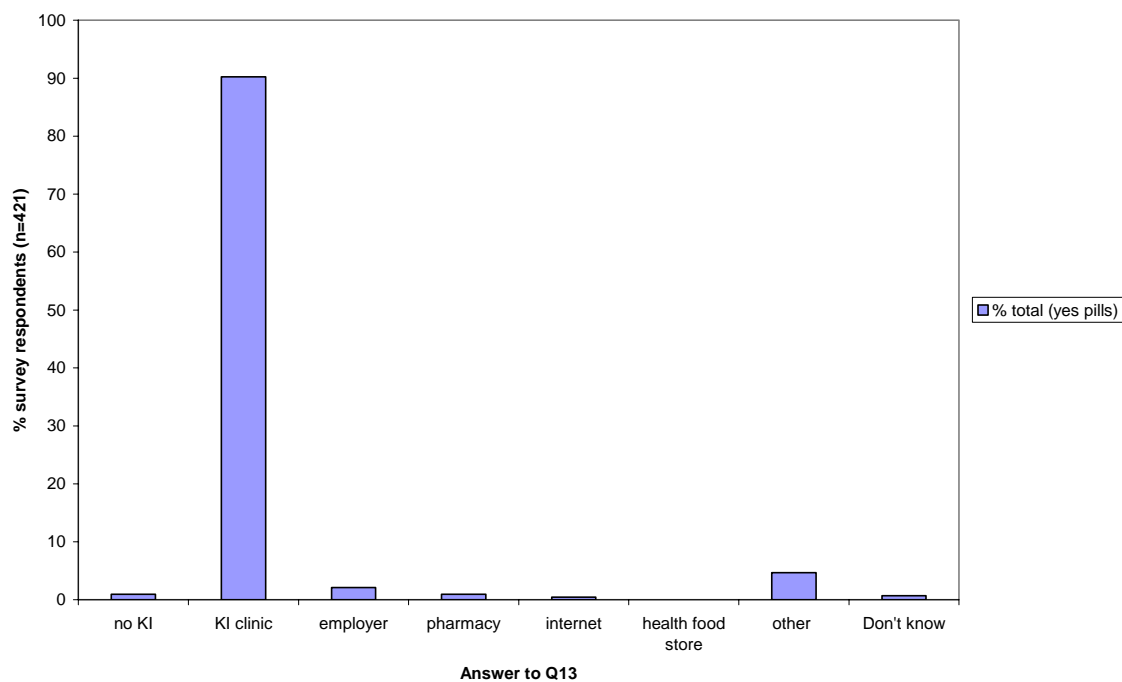
Q11 - Have you obtained a supply of KI pills?



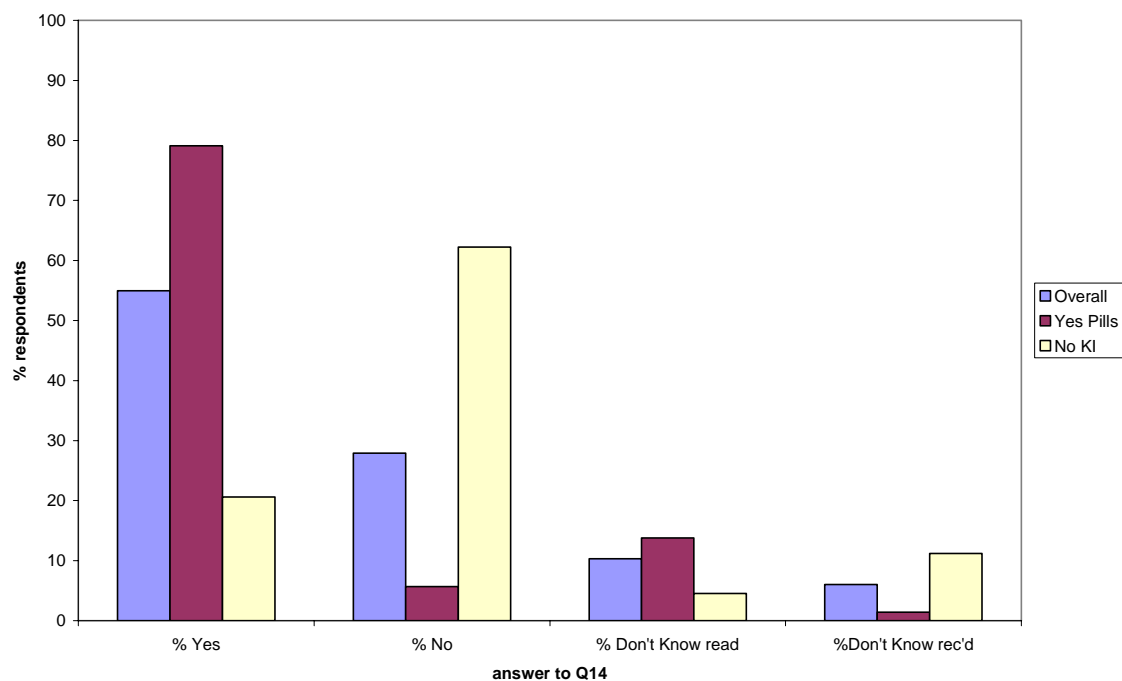
Q12 - (for KI pill recipients only) What have you done with your KI pills?



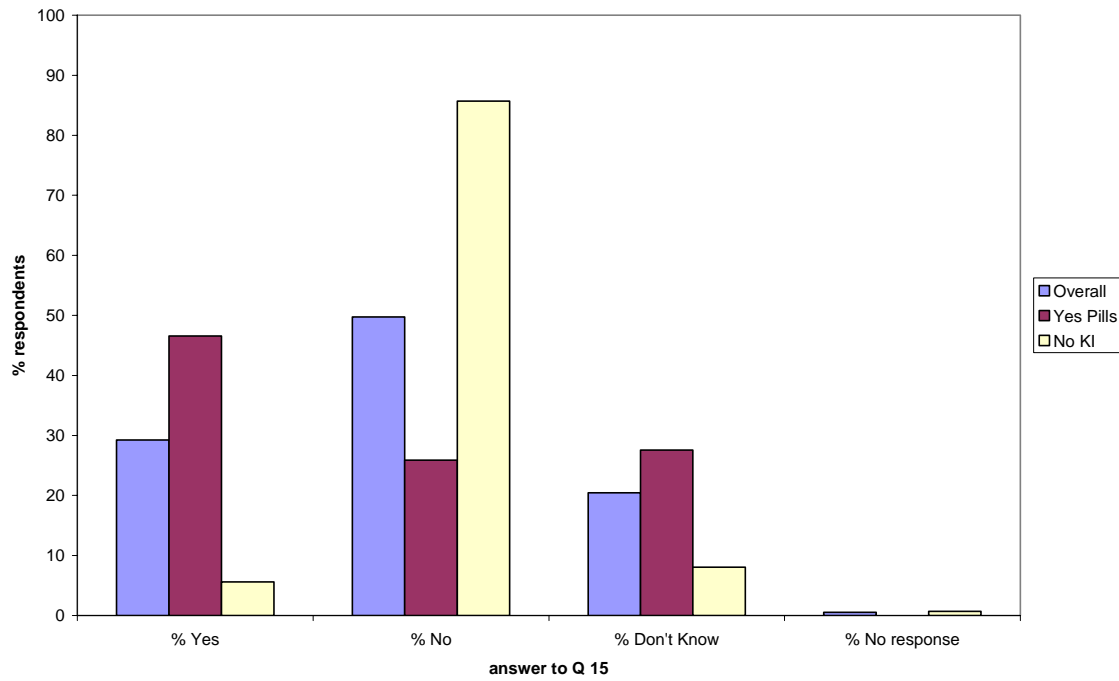
Q13 - (KI pill recipients only) Where did you get your KI pills?



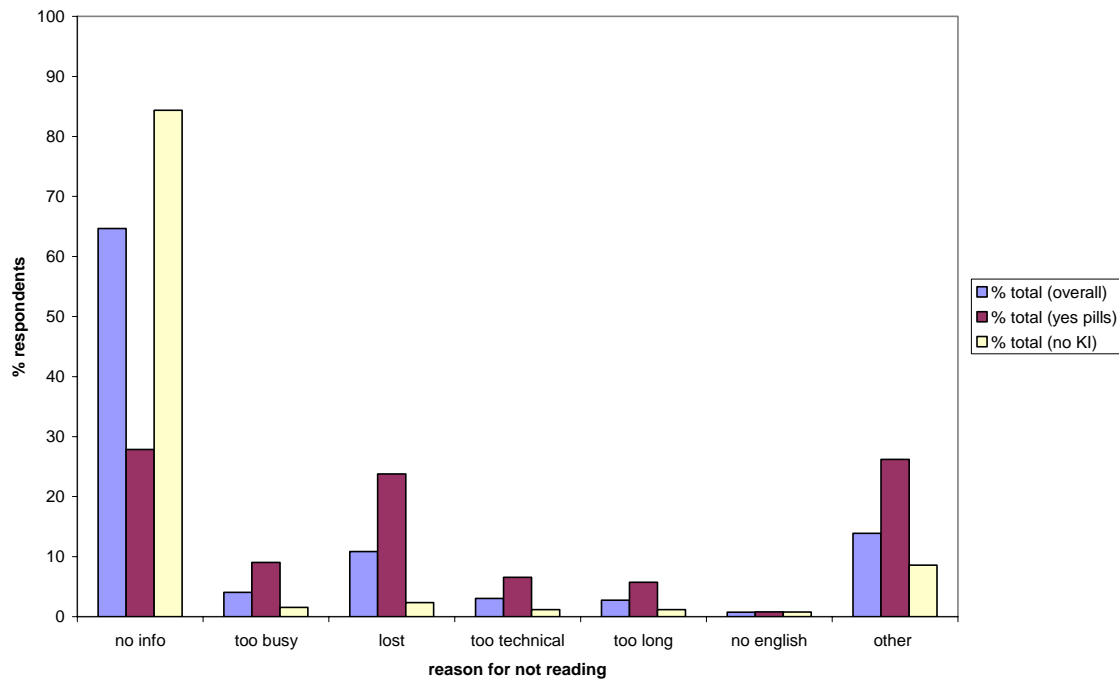
Q14 - Have you read any information or instructions about KI pills?



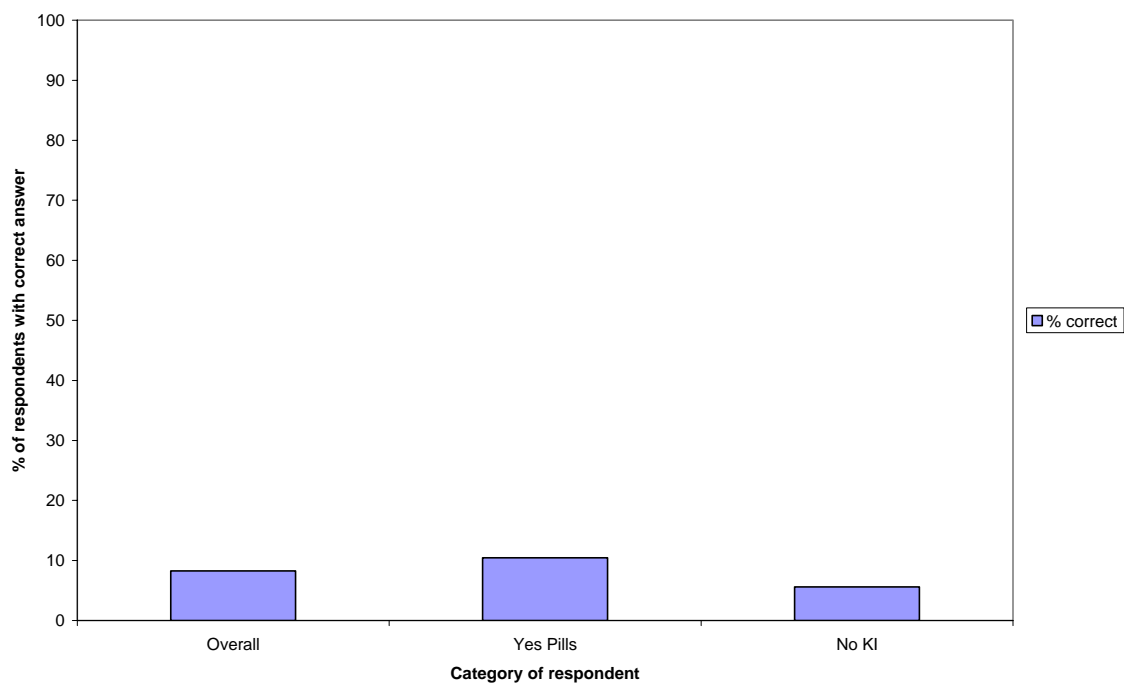
Q15 - Have you read the NJDHSS fact sheet on KI?



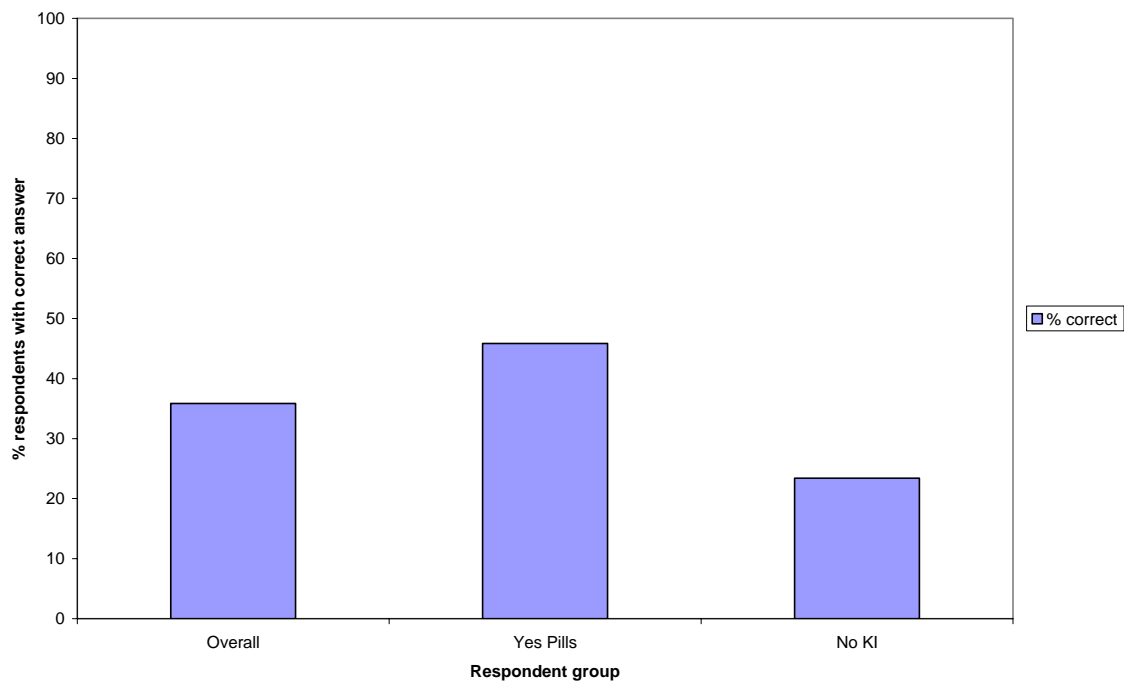
Q16 - If you did not read the information please tell us why.



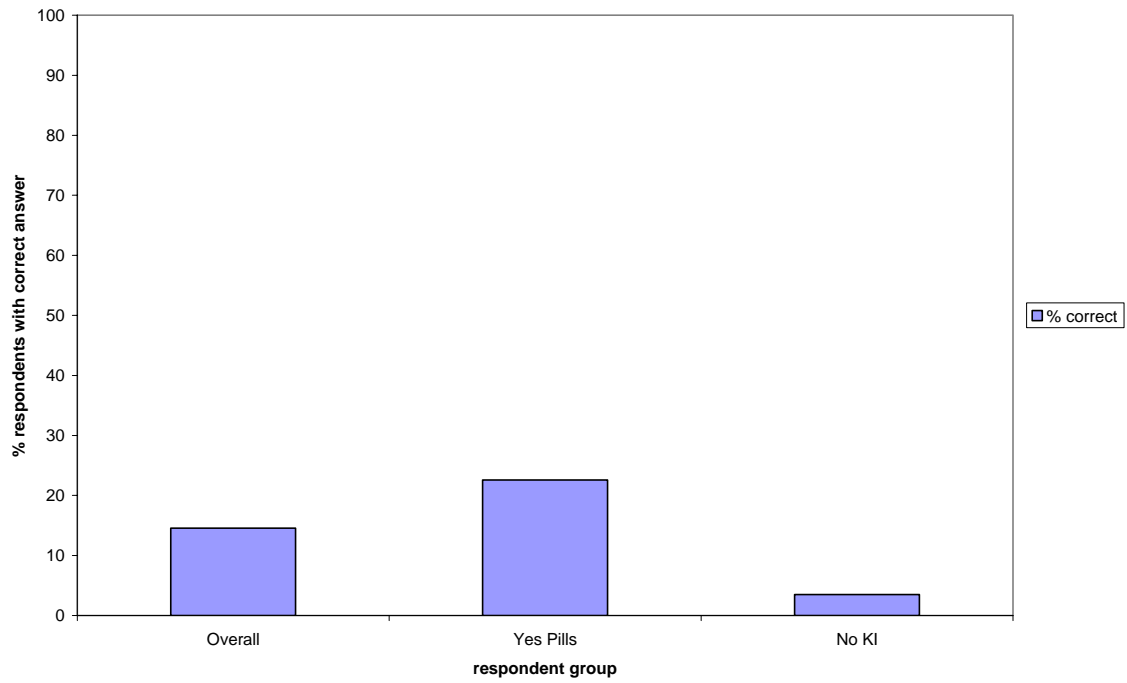
Q17 - Radioactive Iodine present during all rad emergencies. (correct answer is FALSE)



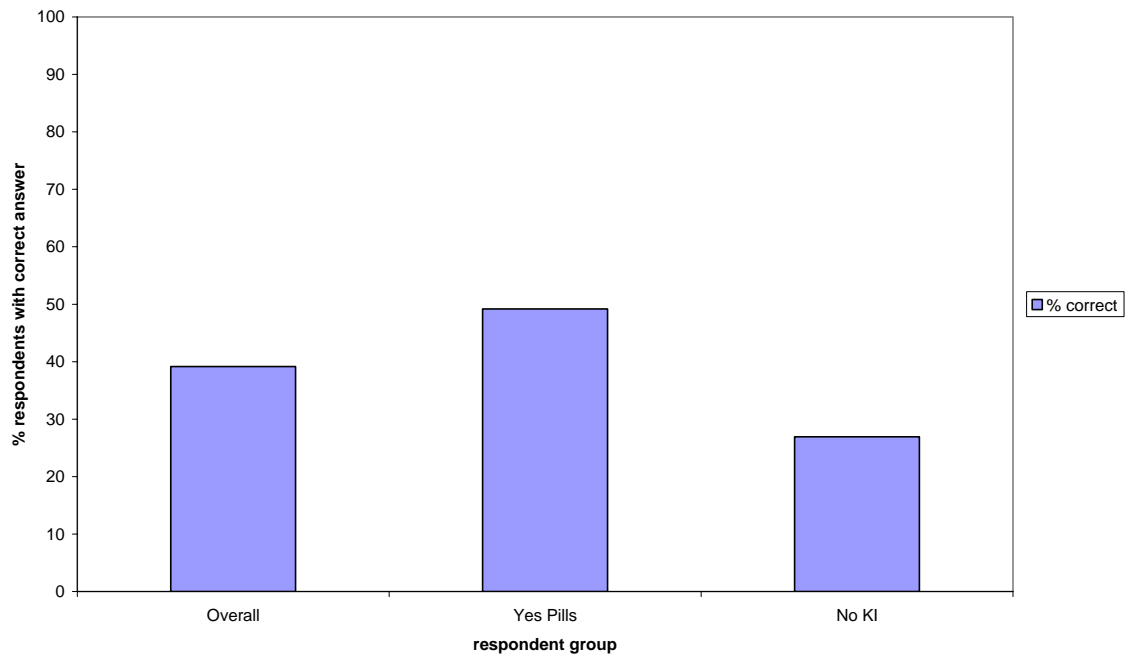
Q18 - KI pills provide protection from all types of radiation (correct answer is FALSE)



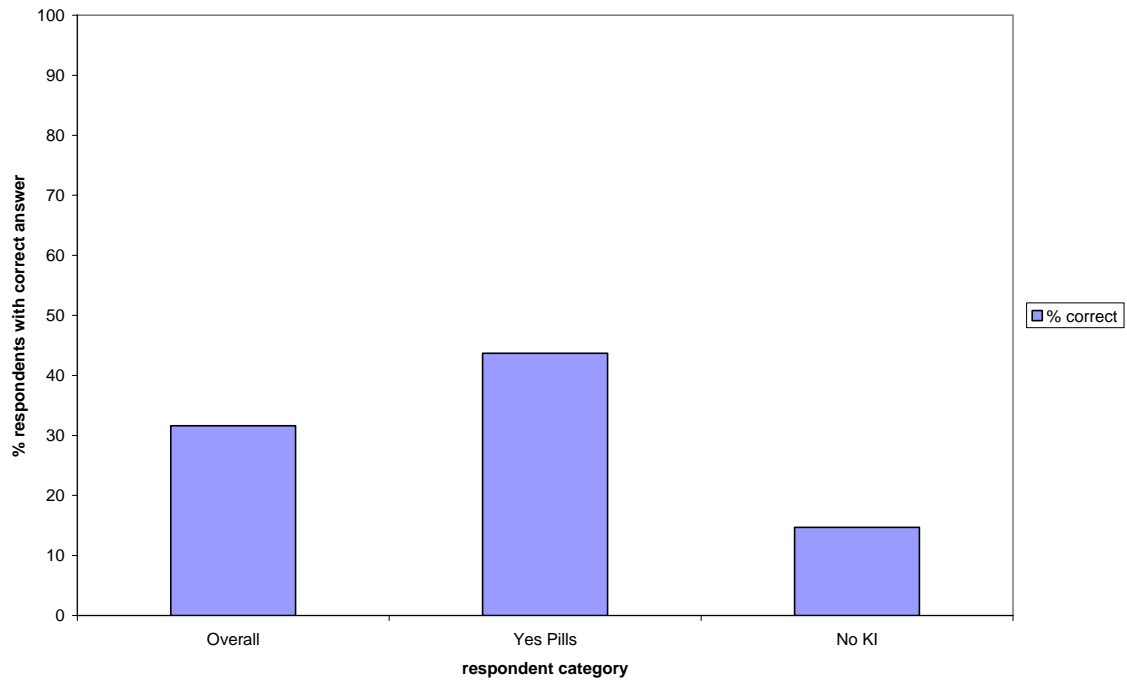
Q19 In general, pregnant women may safely take a KI pill (correct answer is TRUE)



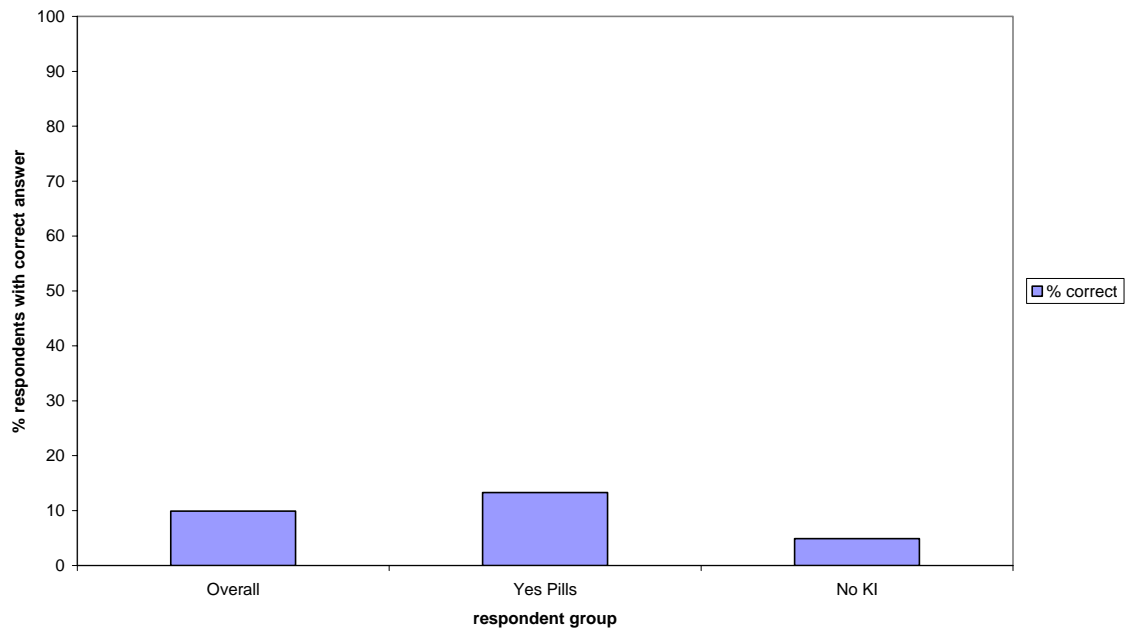
Q20 - Persons who have had or currently have thyroid disease should ask their doctor before taking a KI pill (correct answer is TRUE)



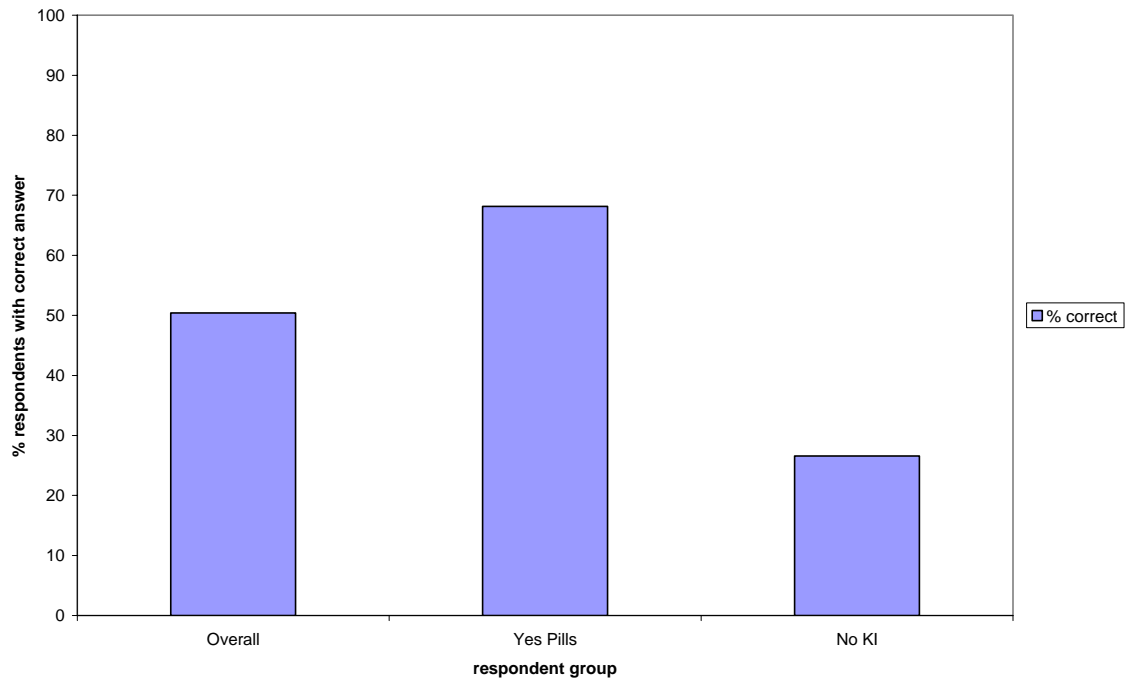
Q21 Persons allergic to iodine can safely take a KI pill (correct answer is FALSE)



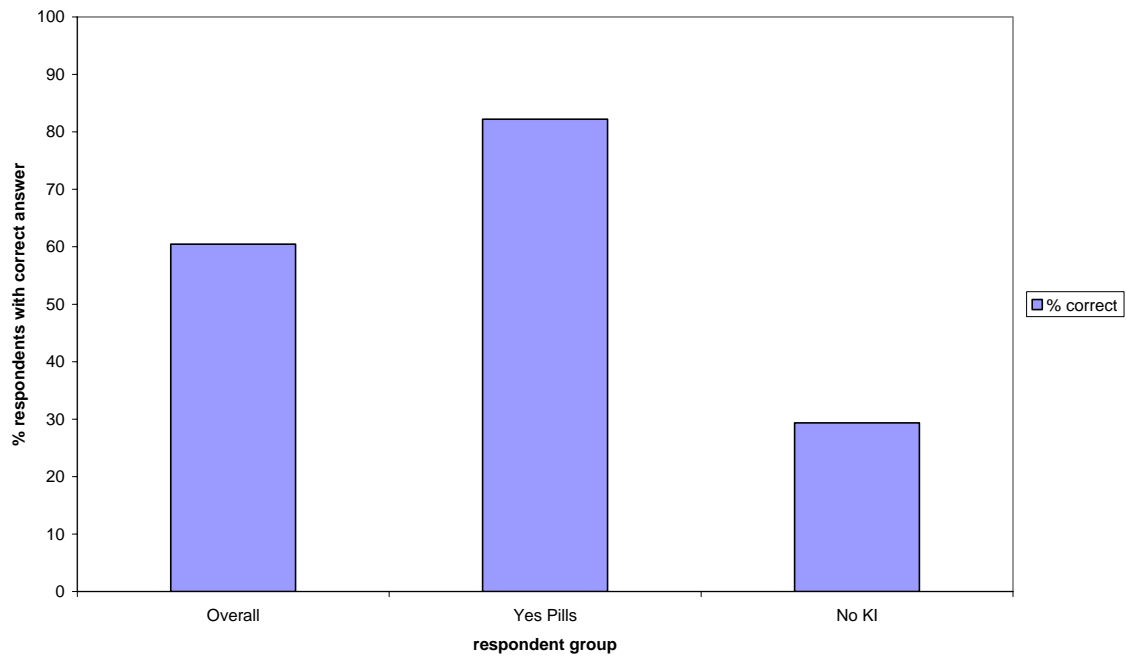
Q22 In general, persons above the age of 40 should take KI if they are exposed to a very small amount of radioactive iodine (correct answer was considered FALSE per CDC; however there is debate regarding this point and not everyone agrees/unresolved)



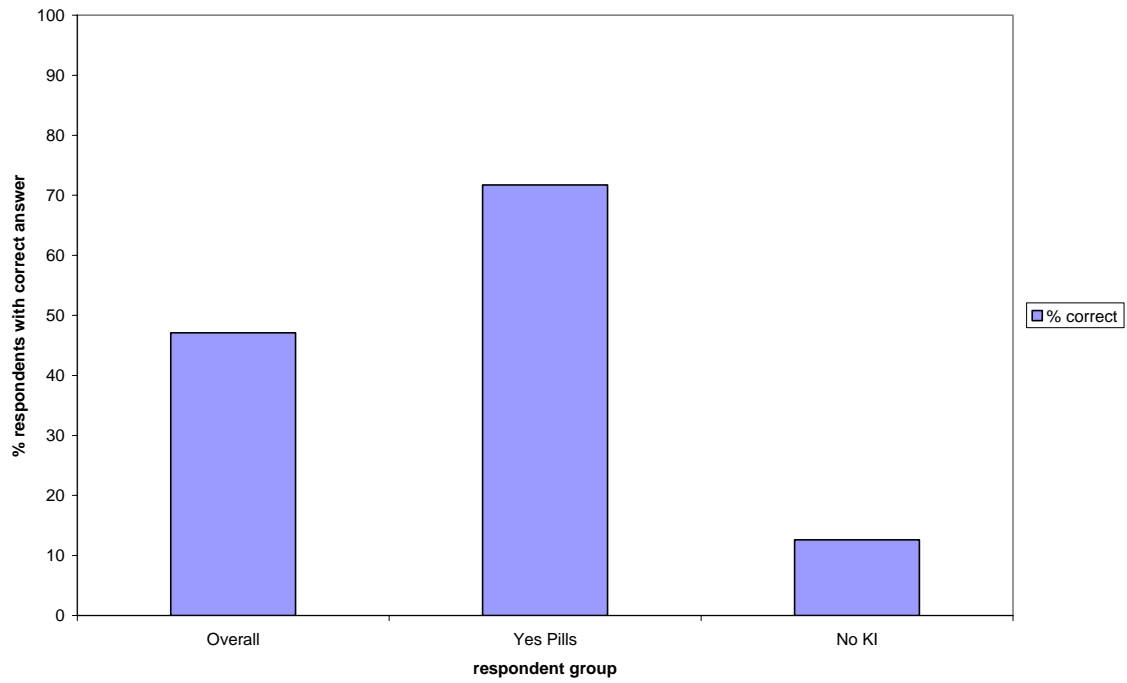
Q23 KI pills or tablets protect "....." (correct answer is "the thyroid only")



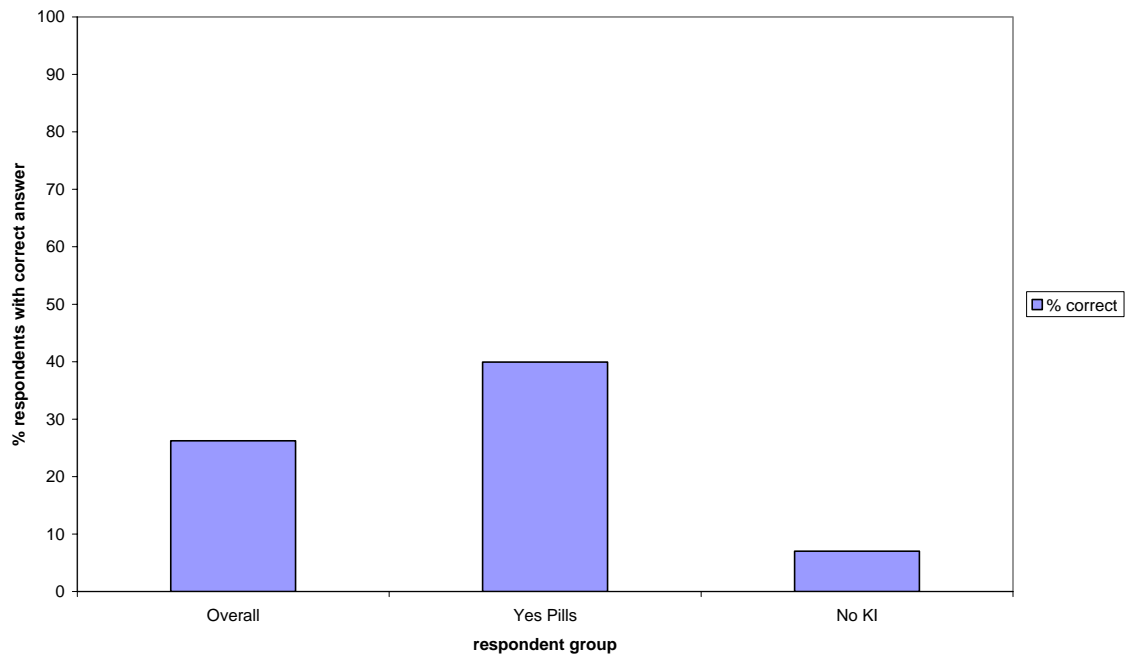
Q24 When should someone take their first dose of a KI pill or tablet? (correct answer is "within hours before or after exposure")



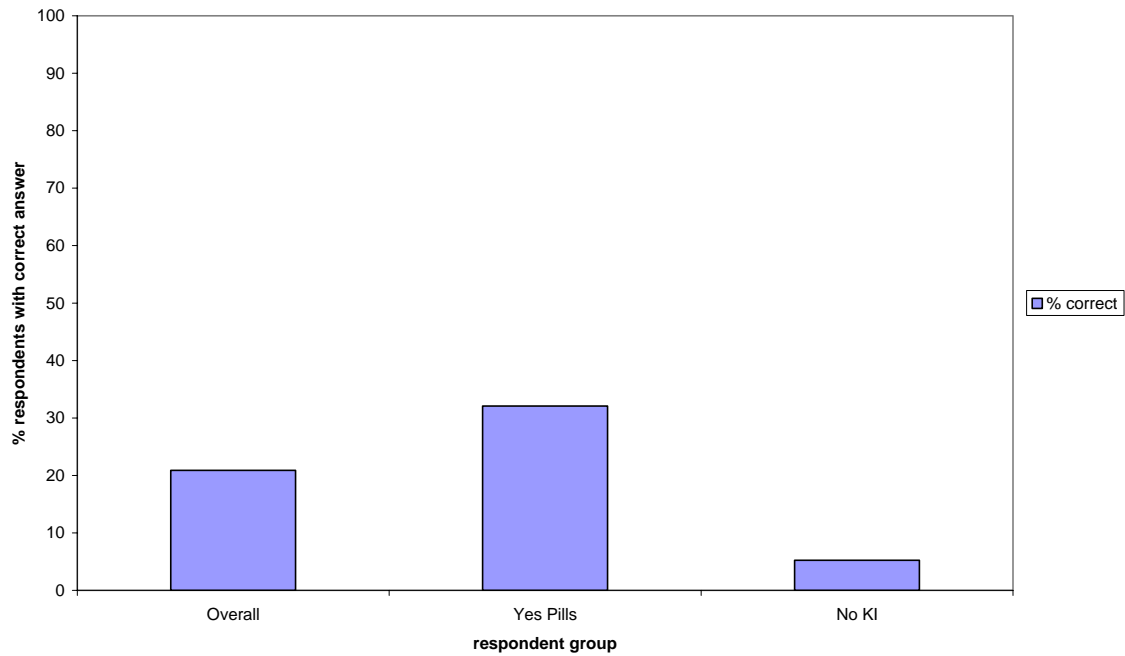
Q25 What is the recommended KI dose for adults (note: 1 tablet = 130 milligrams)



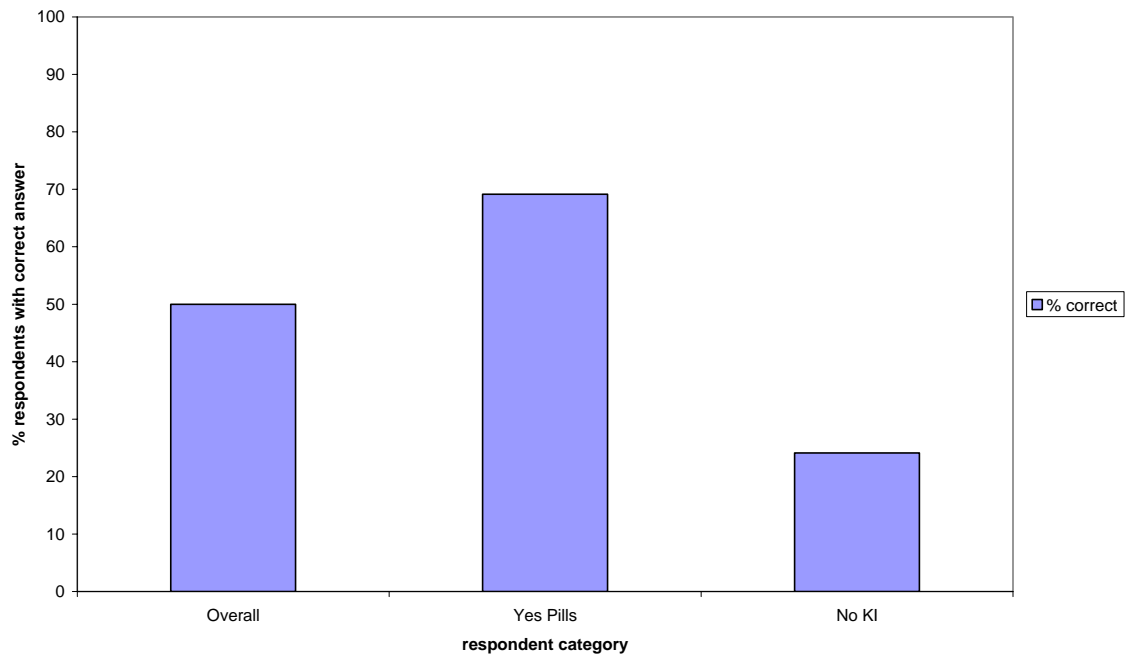
Q26 What is the recommended KI dose for children over 3 years old? (correct answer is "half adult dose")



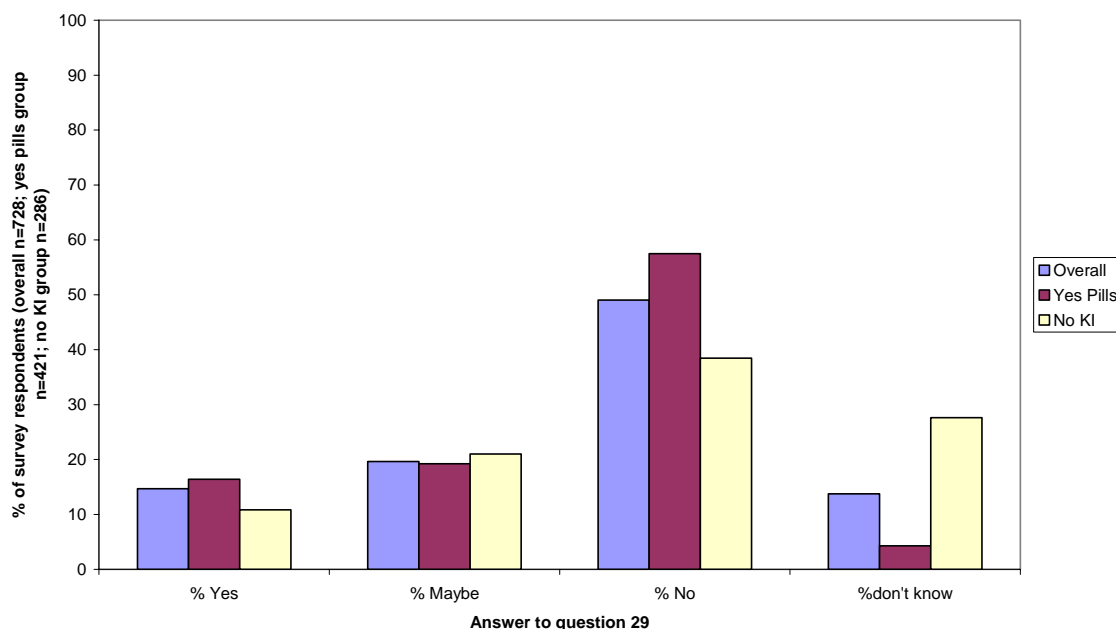
Q27 How long does effective protection last for a single dose of KI? (correct answer is "24 hours")



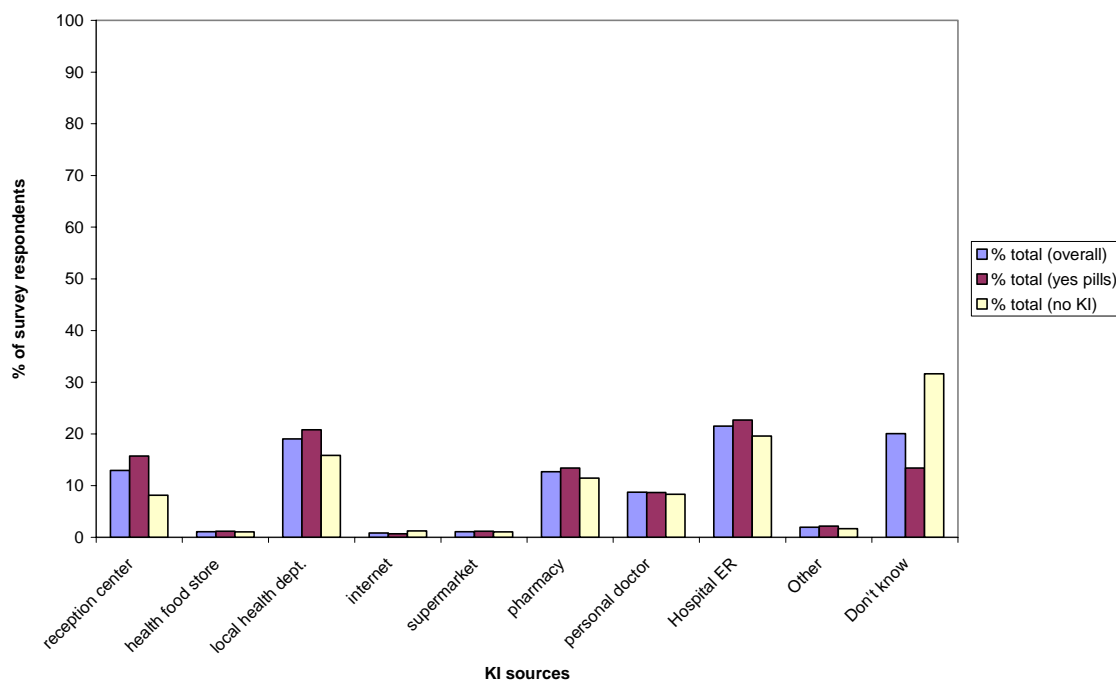
Q28 Would taking several doses of KI at one time provide more immediate protection then just one dose? (correct answer is "NO")



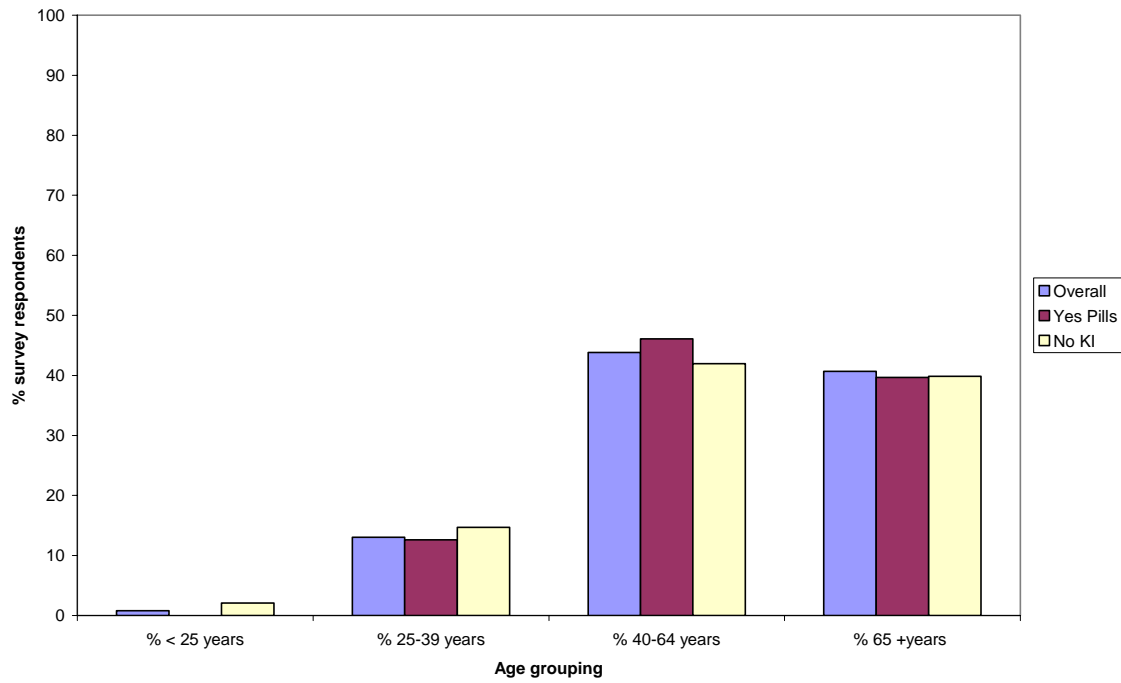
Q29 If you lived in a home located within 10 miles of a nuclear power plant and heard that the nuclear power plant had a significant accident, would you take a KI pill regardless of an official announcement from a government agency or the police?



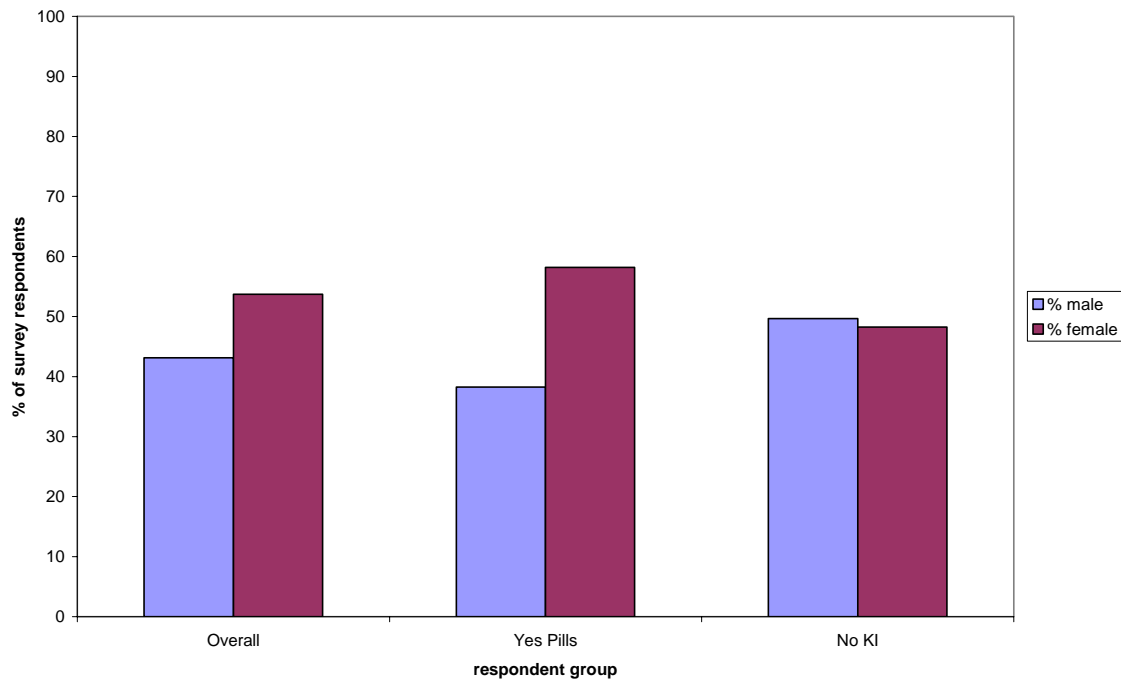
Q30 Where could someone get KI pills in an emergency?



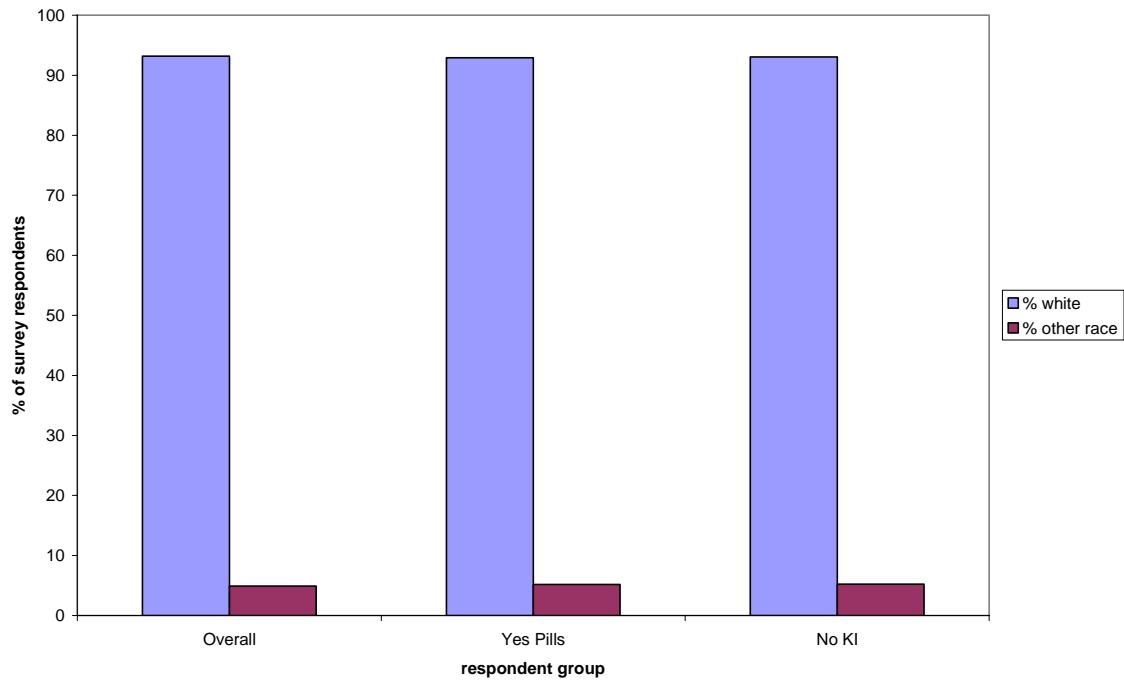
Q31 What is your age?



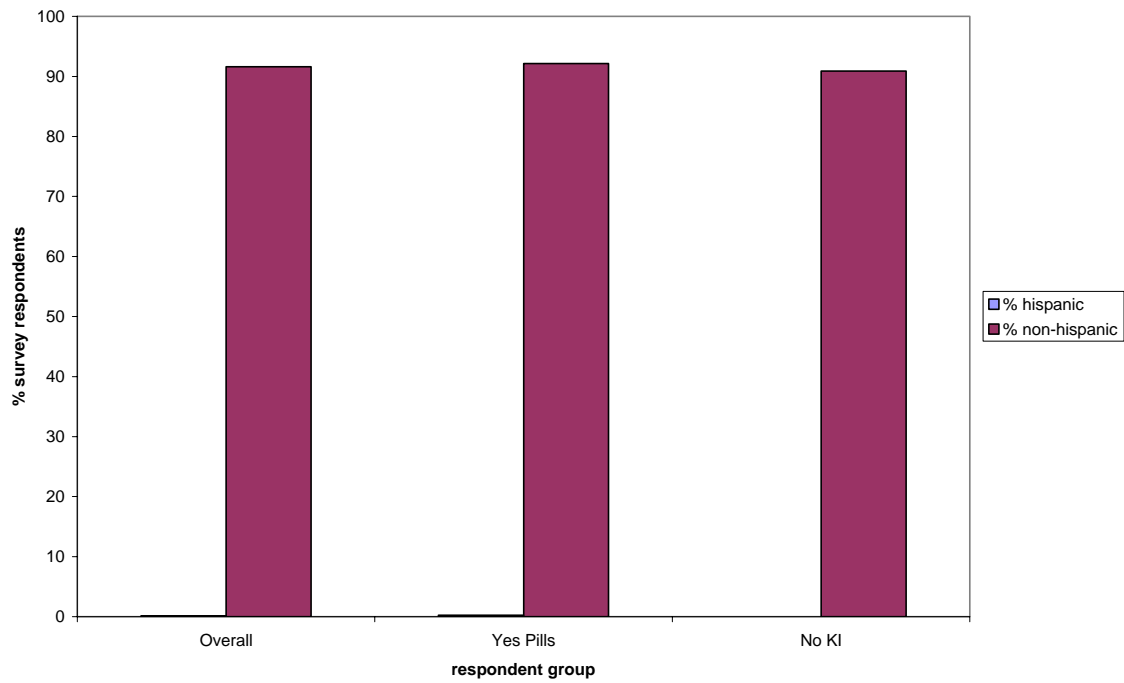
Q32 What is your gender?



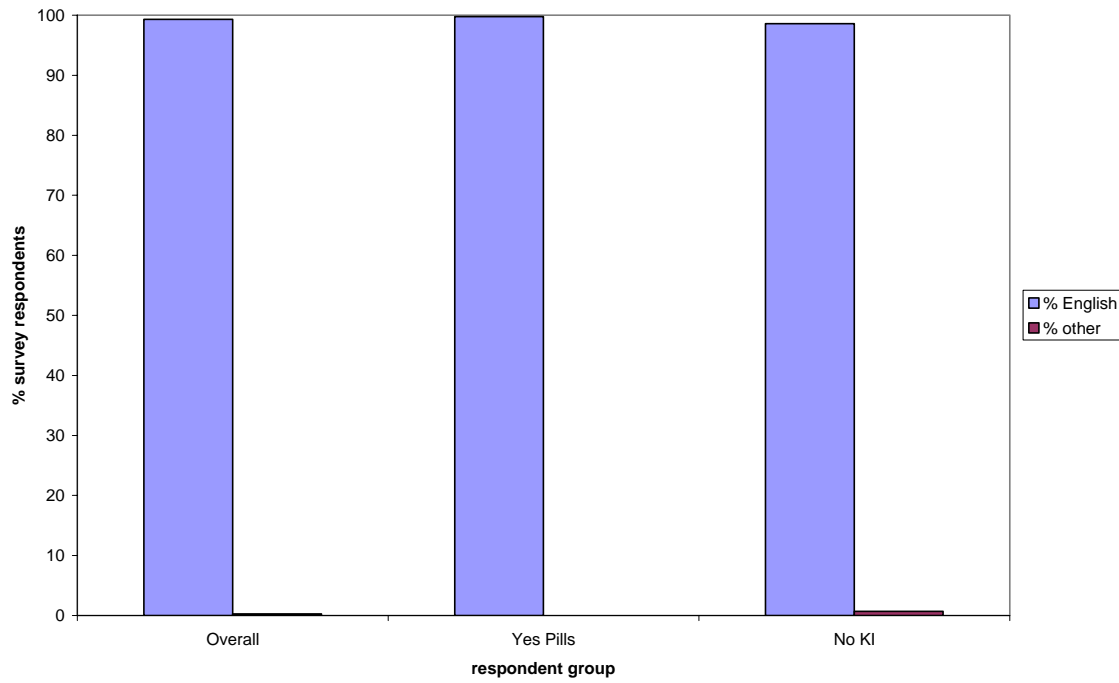
Q33 What is your race?



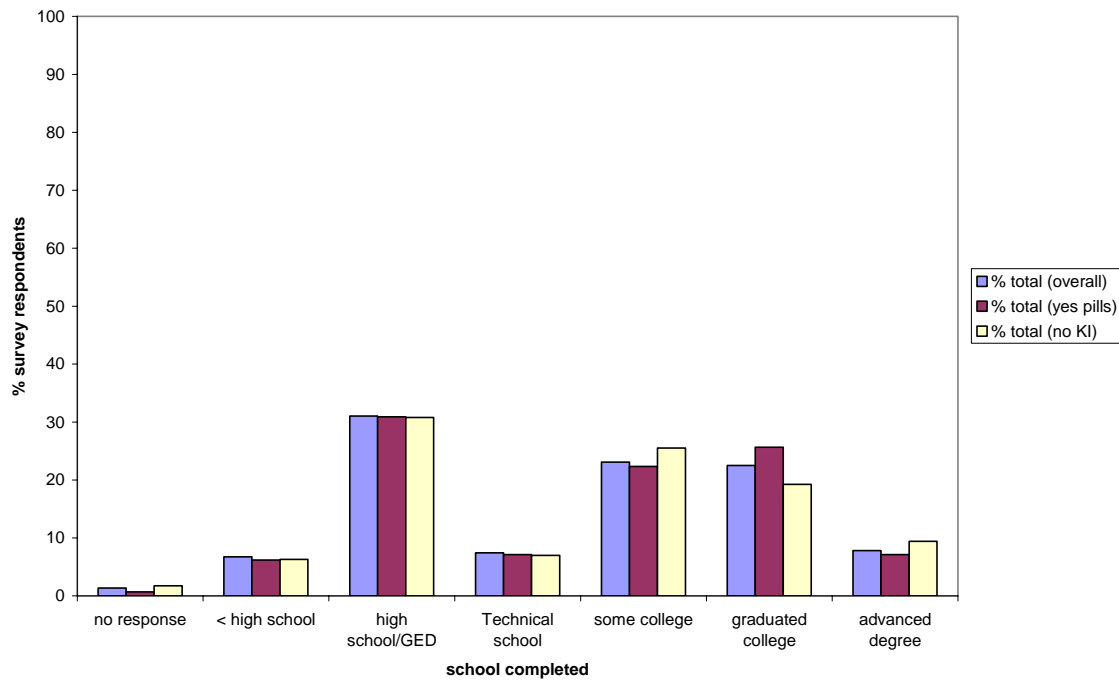
Q34 What is your ethnic background?



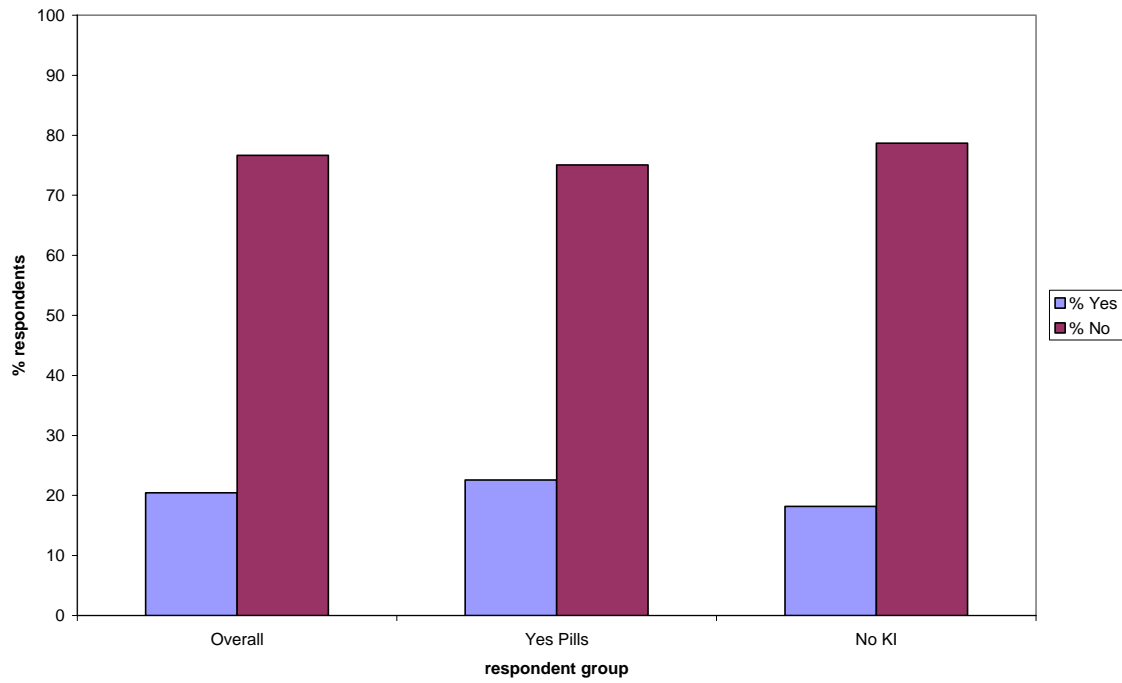
Q35 What is the primary language you speak at home?



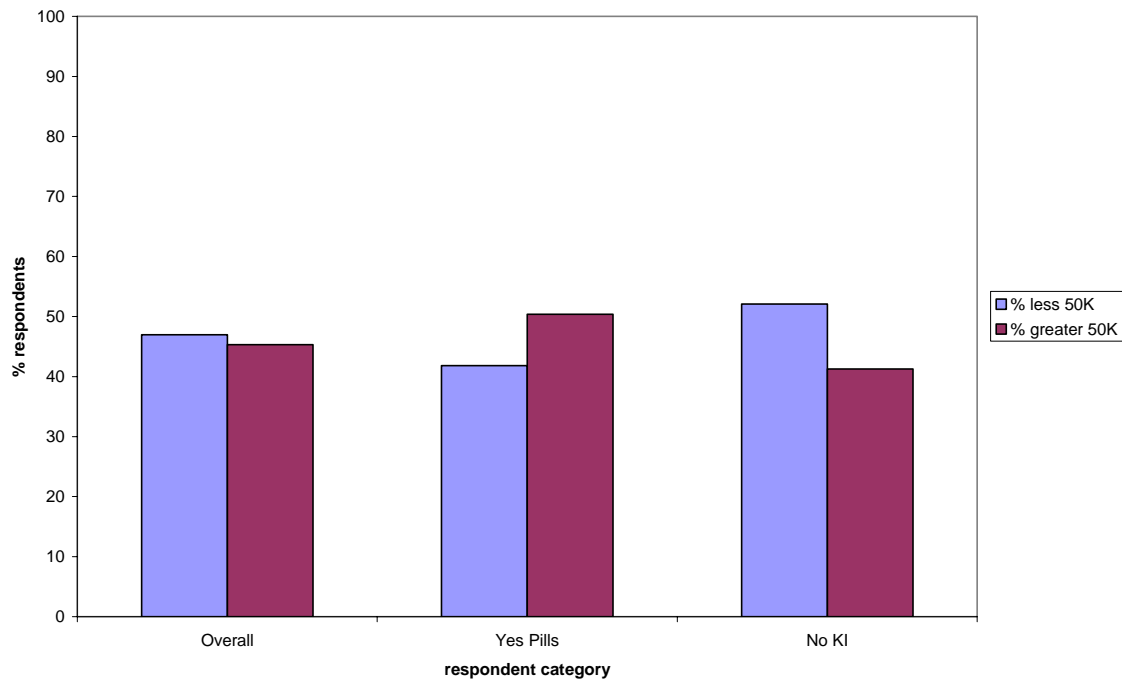
Q36 How much school have you completed?



Q37 Have you completed college level courses in engineering or science?



Q38 Approximately what is your household income level?



Appendix C
Emergency Responder and Health Professional Survey
Questions

Occupational Safety and Health Survey

CONFIDENTIAL!

All information you provide will be kept strictly confidential and analysis will be conducted in a manner that assures your answers will remain anonymous. This survey will be destroyed after this study is completed.

Thank you for your assistance in helping us better serve you.

INSTRUCTIONS:

- ☐ Estimated COMPLETION TIME: 5 - 10 min.
- ☐ Please complete the survey at your earliest convenience.
- ☐ Please take this survey on your own. Please do not use any written materials (e.g. text books, fact sheets, internet searches, etc.) to take this survey.
- ☐ We are trying to improve educational materials regarding nuclear power plant emergencies.
- ☐ Please return in the SELF-ADDRESSED, POSTAGE-PAID ENVELOPE.

- ☐ For questions, please call 1-800-862-4550 or (609)631-4938 or E-mail: ki@doh.state.nj.us

Thank you!

Conducted by:

**New Jersey Department of Health and Senior Services (NJDHSS)
Occupational Health Surveillance Program
PO Box 360
Trenton, NJ 08625-0360
Attn: KI Study
Dr. James Blando**

Part 1 – General Information

The following questions will assist us in better understanding your needs and responsibilities.

Please check the appropriate boxes.

1. Which category best describes your full-time job?

- ☐ Firefighter
- ☐ Police
- ☐ Hazardous Materials Response Team (HAZMAT)
- ☐ Physician
- ☐ Nurse

If so, are you a school nurse? ☐yes ☐no

- ☐ Physician's assistant
- ☐ Pharmacist
- ☐ Emergency medical technician (EMT)/medical responder
- ☐ Public Health Professional in Local Health Department
- ☐ Other (*Please specify:* _____)

2. Have you completed college level classes in engineering or science (such as chemistry, physics, biology)?

☐yes ☐no

3. Is your emergency response unit one of these: volunteer fire company, volunteer ambulance squad, or volunteer HAZMAT team?

☐yes ☐no ☐ not applicable

4. Do you think that you have an adequate supply of proper safety equipment to protect yourself when responding to a nuclear power plant or other radiation emergency?

- ☐ Yes
- ☐ No
- ☐ Don't know

5. Are you generally familiar with the emergency response plans for nuclear power plants?

- ☐ Yes

If yes, what plan (e.g. state, local, etc)? _____

- ☐ No

6. If a nuclear power plant had an accident that resulted in a release of a large amount of radioactive materials to the surrounding community, who would be at the top of the chain of command (the lead agency) in responding to this release?

- ☐ Local Police
- ☐ State Health Department
- ☐ State Police Office of Emergency Management
- ☐ State Dept. of Environmental Protection
- ☐ Federal Nuclear Regulatory Commission
- ☐ Federal Emergency Management Administration
- ☐ Other (please specify): _____
- ☐ Don't Know

7. Which category below best describes your role in the event of a nuclear power plant emergency? (check all that apply)

- ☐ I have no role in response to nuclear power or radiation emergencies
- ☐ I do not know my role
- ☐ Firefighter
- ☐ Police
- ☐ Hazardous Materials Response Team (HAZMAT)
- ☐ Medical professional (e.g. physician, nurse, pharmacist)
- ☐ Public Health Professional in Local Health Department
- ☐ Other (*Please specify:* _____)

8. Briefly describe your duties or responsibilities in a nuclear power plant or radiation emergency? If you do not have any please write “none”. If you are not sure, please write “unknown”.

9. Do you think that you need more guidance and training concerning emergencies at nuclear power plants? If so, what topics for training would you suggest.

10. If you would like to provide us with any other comments please do so below:

Part 2 – KI USE

11. Have you ever heard of:

- | | | | |
|--------------------------------------|------------------------------|-----------------------------|-----------------------------------|
| d. potassium iodide pills or tablets | <input type="checkbox"/> yes | <input type="checkbox"/> no | <input type="checkbox"/> not sure |
| e. KI pills or tablets | <input type="checkbox"/> yes | <input type="checkbox"/> no | <input type="checkbox"/> not sure |
| f. Anti-radiation pills or tablets | <input type="checkbox"/> yes | <input type="checkbox"/> no | <input type="checkbox"/> not sure |

For the rest of this survey, we will use “KI ” to reference “potassium iodide pills or tablets” or “KI pills or tablets.”

12. From which of the following sources have you received any information about KI (check all that apply)?

- ☐ I have not received any information about KI
 - ☐ As part of job training
 - ☐ Television
 - ☐ Newspapers
 - ☐ Information given out at a KI distribution clinic
 - ☐ Personal health-care provider (e.g., doctor, nurse practitioner, physician assistant, pharmacist, chiropractor, etc.)
 - ☐ Friend, neighbor, acquaintance, etc.
 - ☐ Internet
 - ☐ Radio
 - ☐ Other (*please briefly describe the source*):
-

Each of the following questions has only one answer. If you find that you do not know an answer, please do not guess. Just indicate, 'Don't know'. Please answer these questions on your own and do not use any written materials (textbooks, internet searches, etc.) to answer these questions.

| | <u>True</u> | <u>False</u> | <u>Don't know</u> |
|--|--------------------------|--------------------------|--------------------------|
| 13. Radioactive iodine is present during all radiation emergencies, including "dirty bombs". | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. KI pills provide protection from all types of radiation. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. In general, pregnant women may safely take a KI pill. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Persons who have had or currently have thyroid disease should ask their doctor before taking a KI pill. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Persons allergic to iodine can safely take a KI pill. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. In general, persons above the age of 40 should take KI if they are exposed to a very small amount of radioactive iodine. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Reminder, "KI" means "potassium iodide pills or tablets" or "KI pills or tablets".

19. KI pills or tablets protect "_____".

- ☐ the whole body
- ☐ the brain only
- ☐ the thyroid only
- ☐ don't know

20. When should someone take their first dose of a KI pill or tablet?

- ☐ As soon as KI pills are received or purchased, regardless of exposure to accidental releases of radioactive material from nuclear power plants
- ☐ Within hours before or after exposure to accidental releases of radioactive material from nuclear power plants
- ☐ Only if they feel sick after exposure to accidental releases of radioactive material from nuclear power plants
- ☐ Don't know

21. What is the recommended KI dose for adults? (note: 1 tablet = 130 milligrams)

- ☐ ½ of a tablet
- ☐ One full tablet
- ☐ Two full tablets
- ☐ Don't know

22. What is the recommended KI dose for children over 3 years old?

- ☐ ½ of adult dose
- ☐ Same as adult dose
- ☐ 2 times the adult dose
- ☐ Don't know

23. How long does effective protection last for a single dose of KI?

- ☐ 24 hours
- ☐ One full month
- ☐ One full year
- ☐ A lifetime

- ☐ Don't know

24. Would taking several doses of KI at one time provide more immediate protection than just one dose?

- ☐ Yes
- ☐ No
- ☐ Don't know

Part 3 – About You

The following questions will help us describe the group that answered the questionnaire. All of your answers on this questionnaire are kept strictly confidential.

25. What is your age?

- ☐ Under 25
- ☐ 25-39
- ☐ 40-64
- ☐ 65 or older

26. What is your gender?

- ☐ Male
- ☐ Female

27. What is your race? You may choose all options that best describe your race.

- ☐ Alaska Native or American Indian
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ White

- ☐ Another race - *please specify:* _____

28. What is your ethnic background?

- ☐ Hispanic
- ☐ Non-Hispanic

29. How much school have you completed?

- ☐ Did not attend school beyond 8th grade
- ☐ 9th-11th grade
- ☐ Graduated High School or GED
- ☐ Technical School
- ☐ Some College
- ☐ Graduated college
- ☐ Advanced degree (e.g., Masters, Doctorate)

30. What is the primary language that you speak at home?

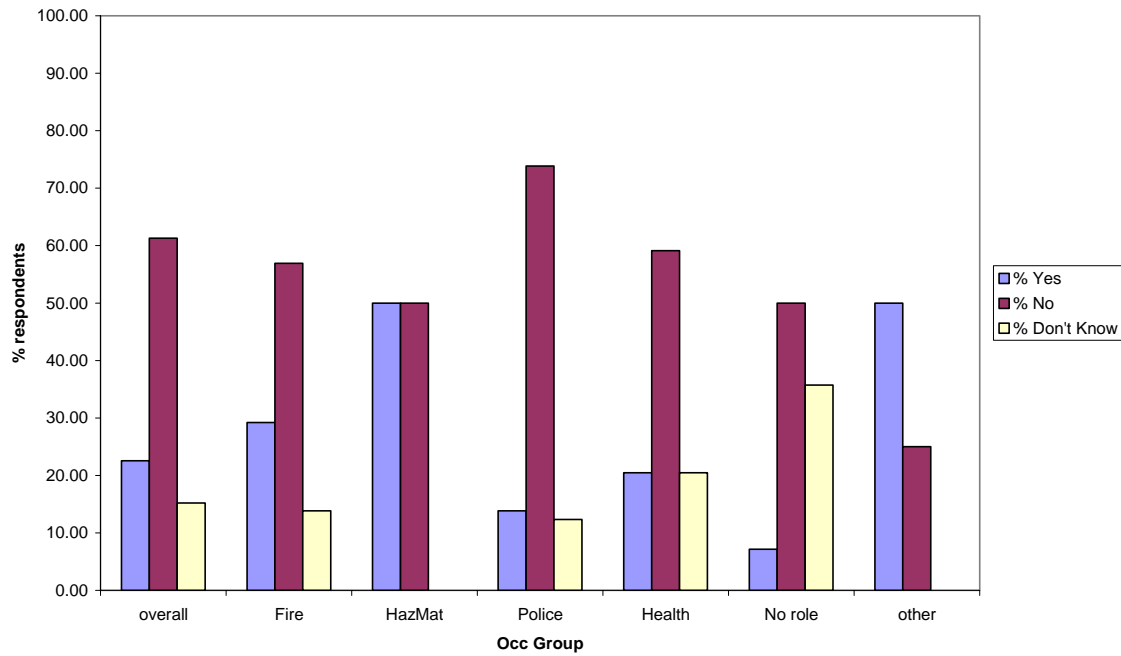
- ☐ English
- ☐ Spanish
- ☐ Other; please specify _____

31. Approximately what is your household income bracket?

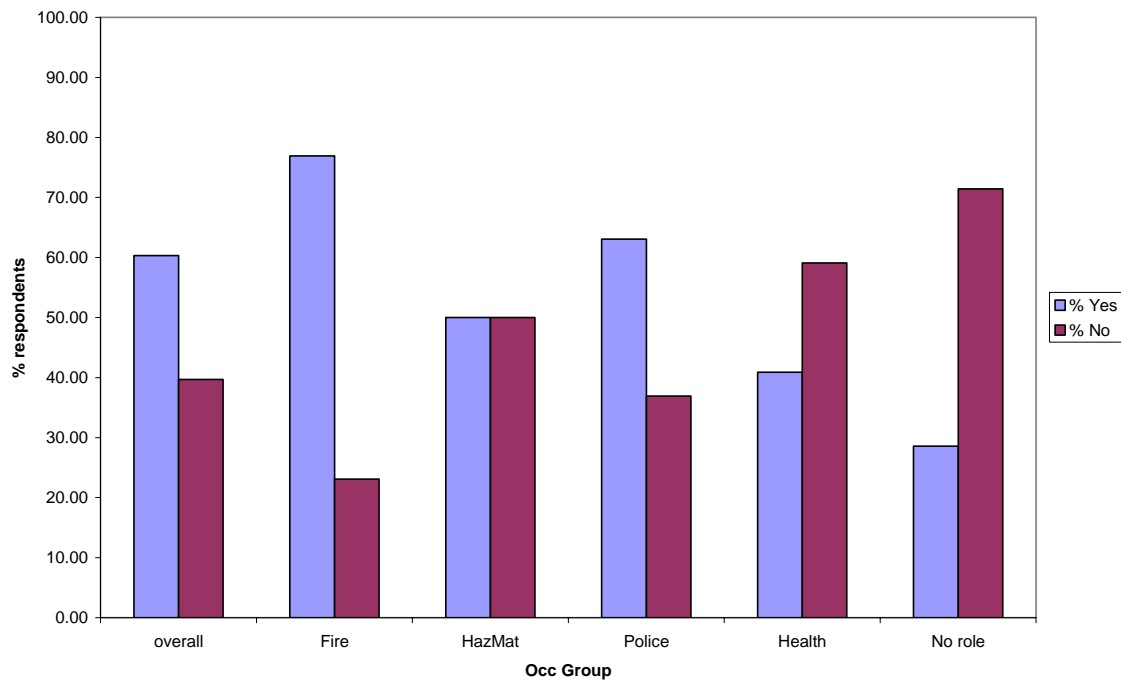
- ☐ Less than \$50,000 per year
- ☐ Greater than \$50,000 per year

Appendix D
Summary of Responses to Emergency Responder and
Health Professional Survey Questions

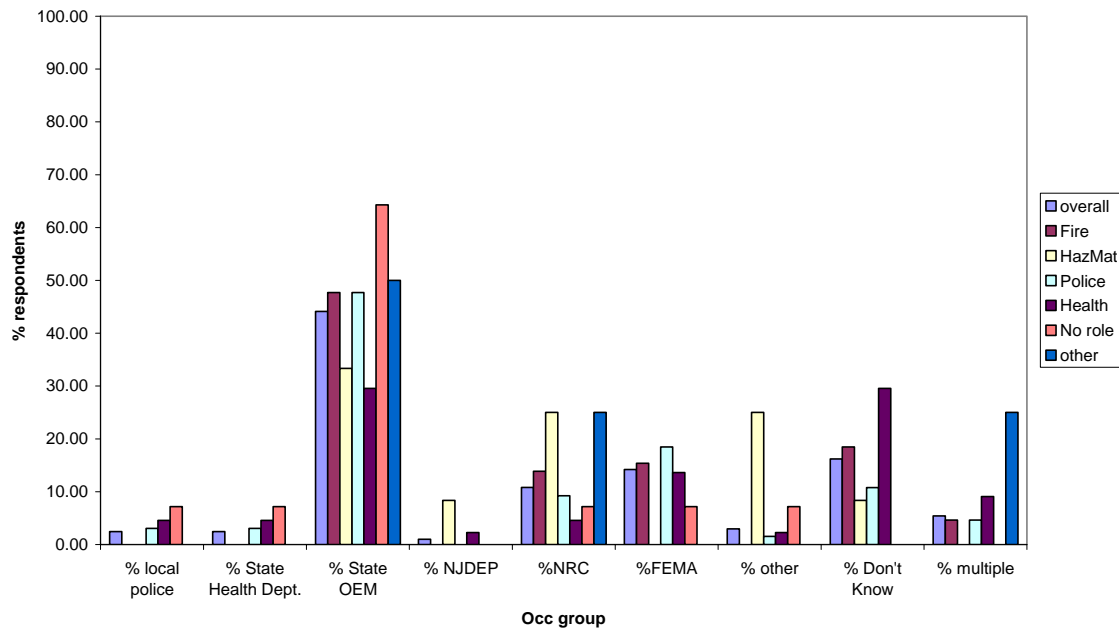
Q4 - Do you think you have an adequate supply of proper safety equipment to protect yourself when responding to a nuclear power plant or other radiation emergency?



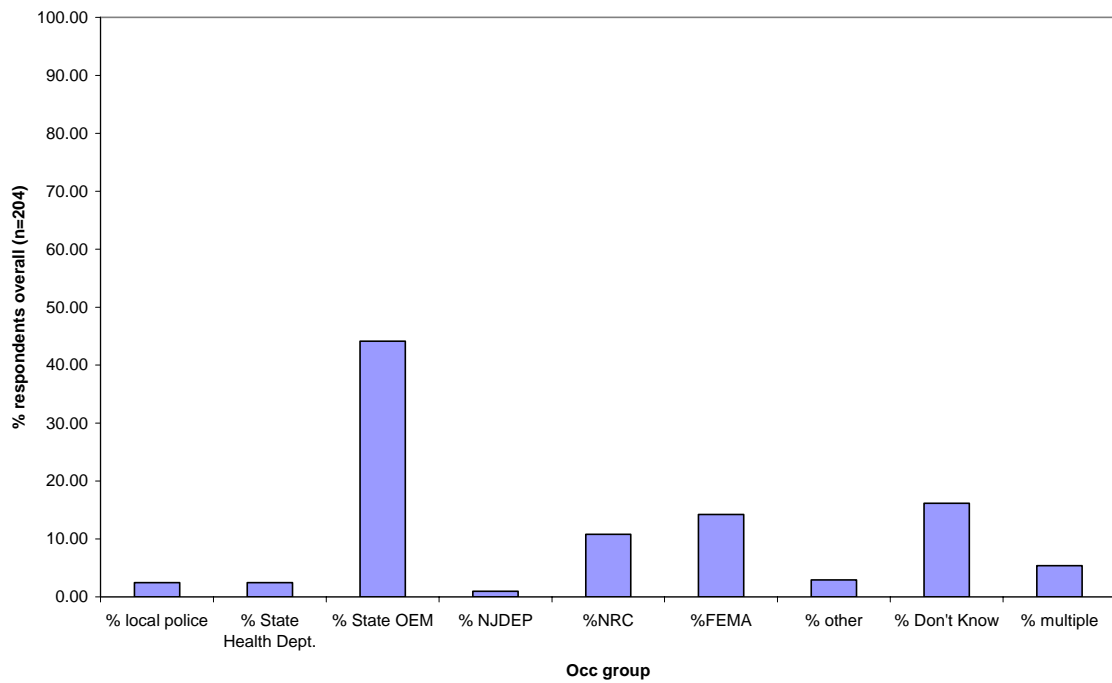
Q 5 - Are you generally familiar with emergency response plans for nuclear power plants?



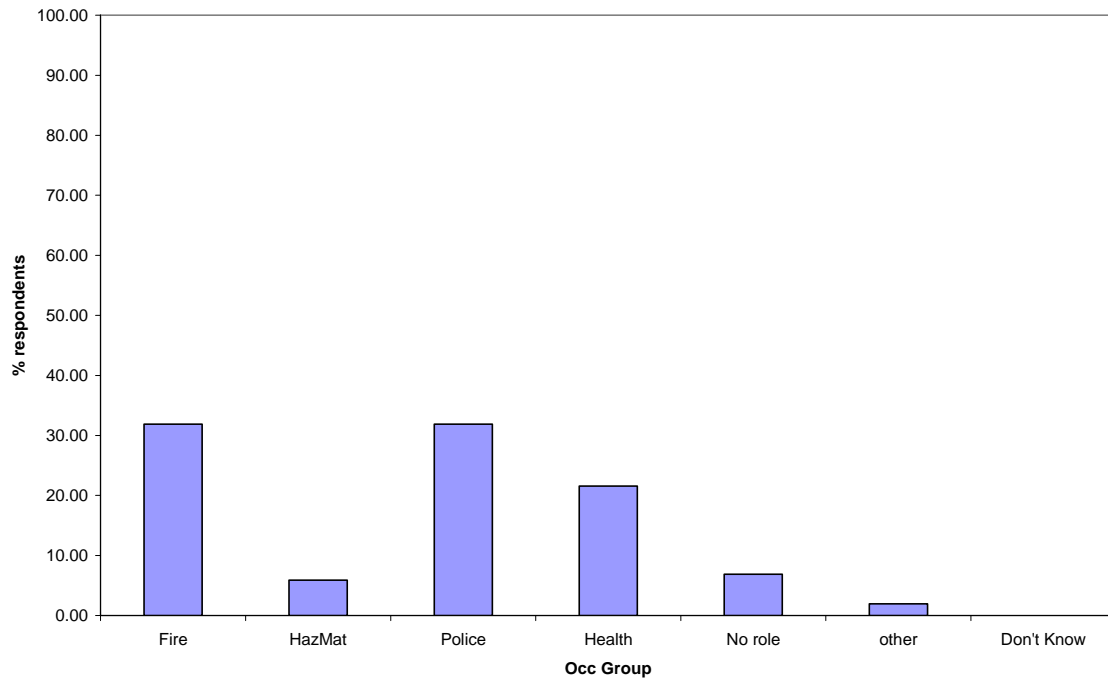
Q6 - If a nuclear power plant had an accident that resulted in a release of a large amount of radioactive materials to the surrounding community, who would be at the top of the chain of command (i.e. the lead agency) in responding to this release?



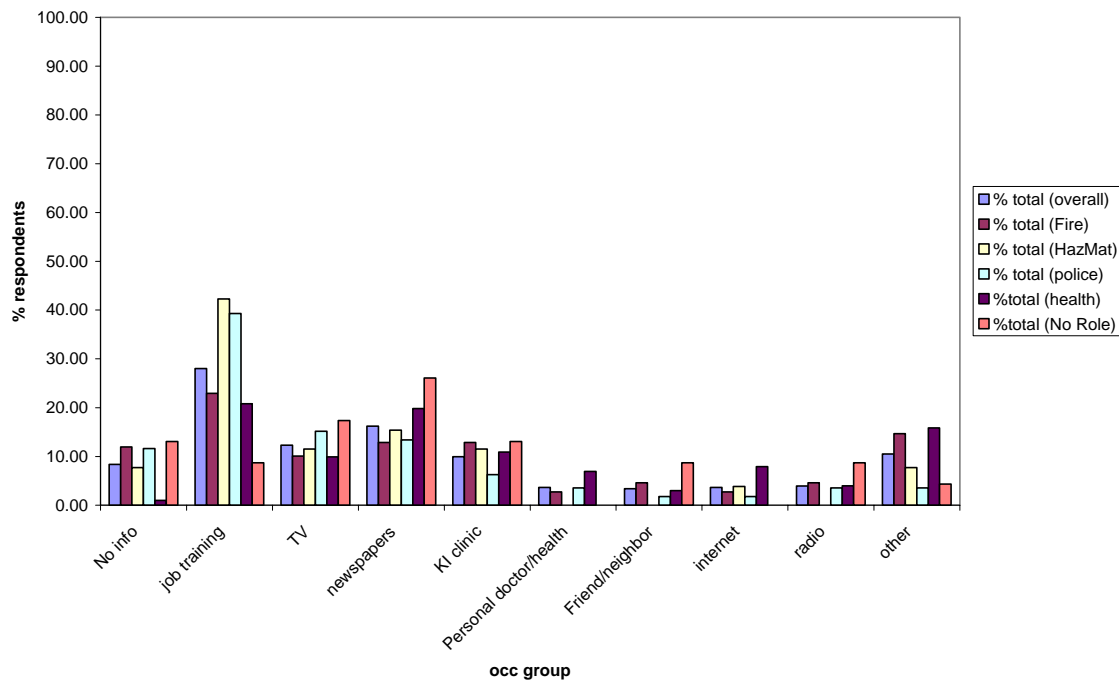
Q6 - Lead agency question- who is the lead? (Note: the correct answer is STATE OEM)



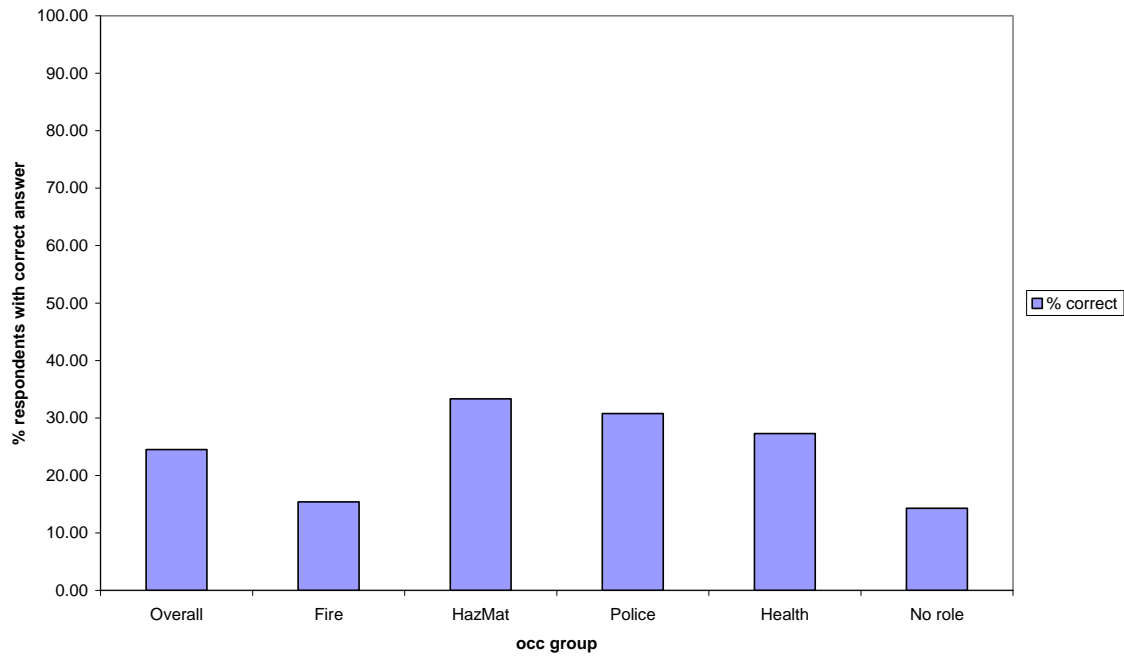
Q7 - Which category describes your role in the event of a nuclear power plant emergency?



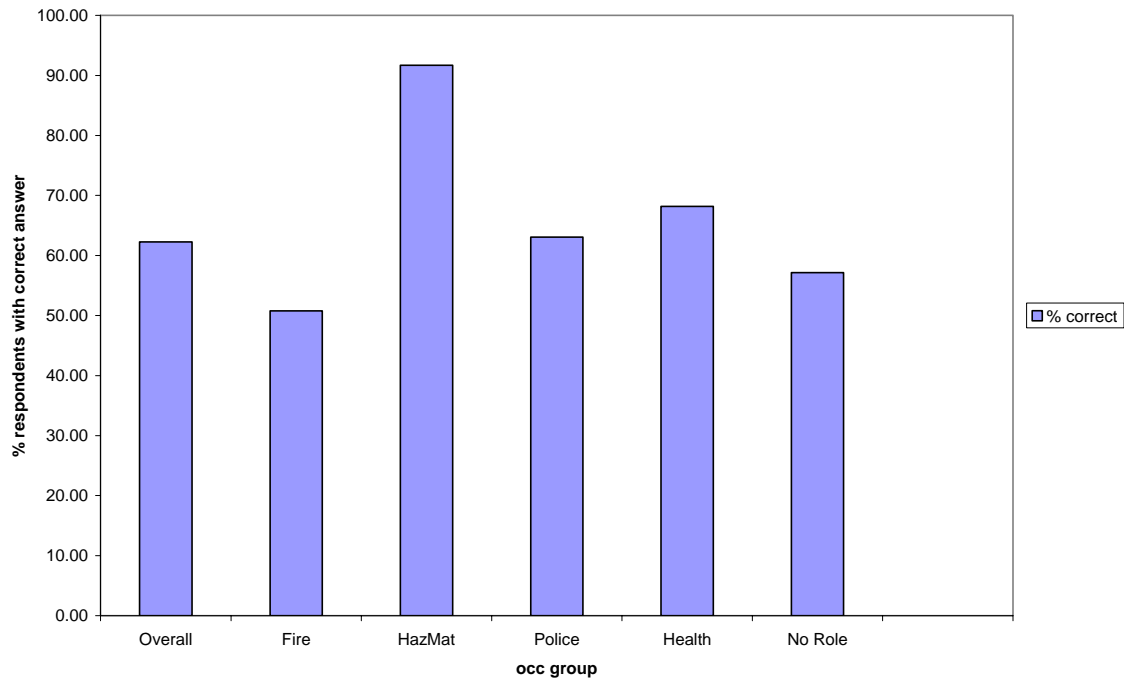
Q12 From which of the following sources have you received any information about KI?



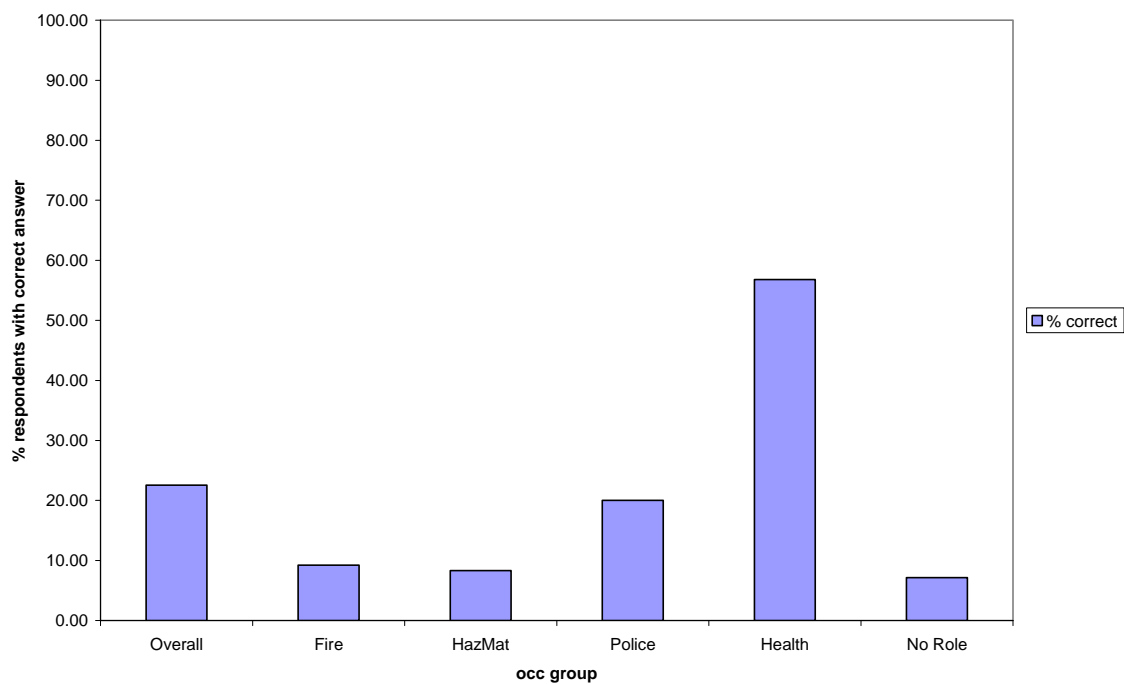
**Q13 - Radioactive iodine is present during all radiation emergencies, including dirty bombs
(correct answer is "FALSE")**



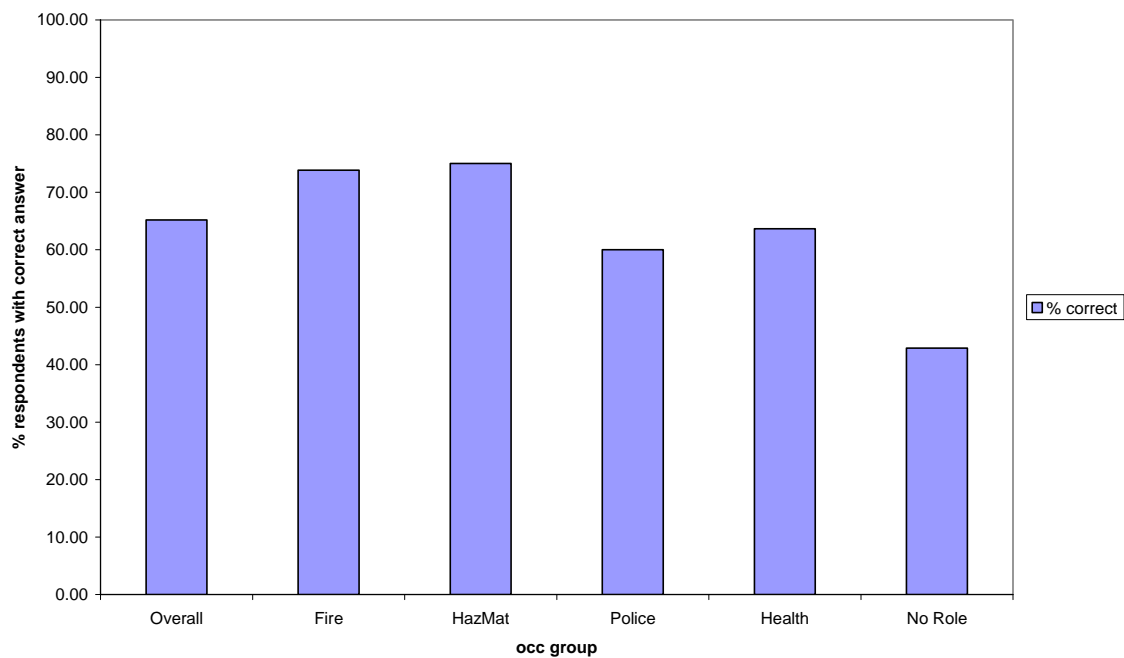
Q14 - KI pills provide protection from all types of radiation (correct answer is FALSE)



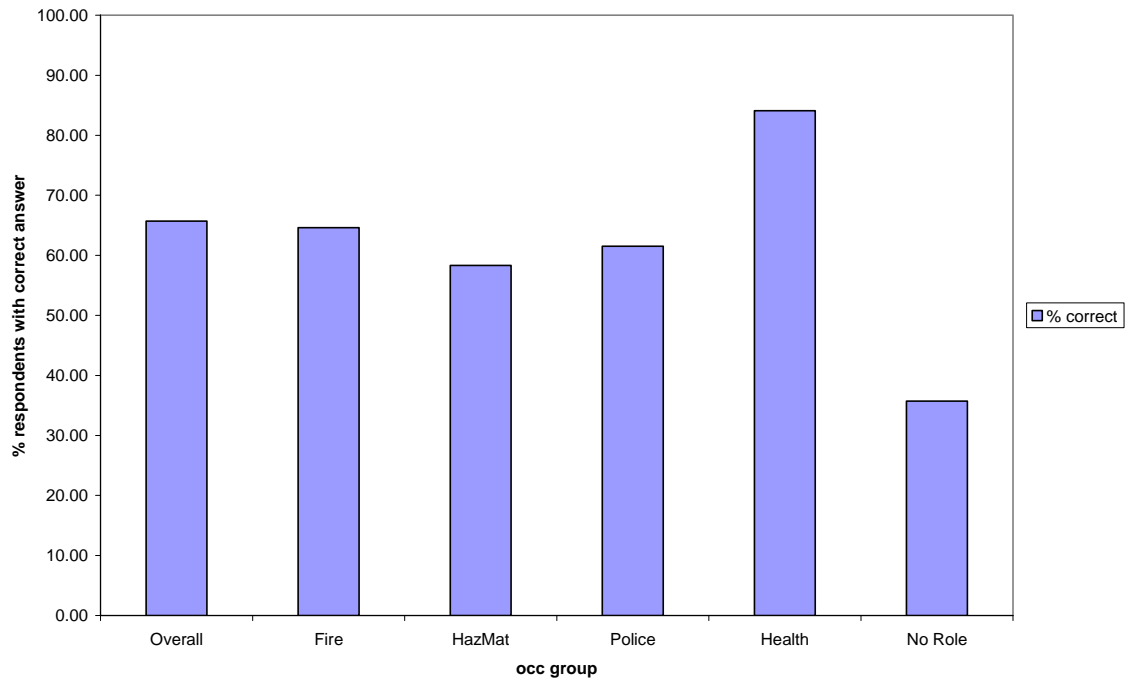
Q15 In general, pregnant women may safely take a KI pill (correct answer is TRUE)



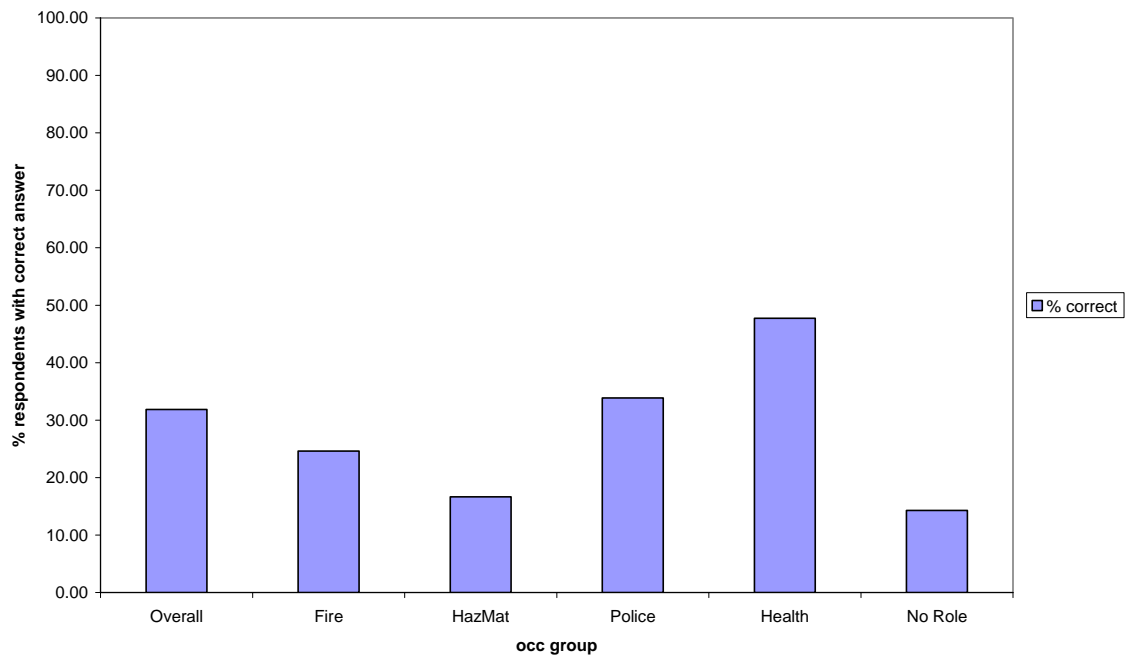
Q16 - Persons who have had or currently have thyroid disease should ask their doctor before taking a KI pill. (correct answer is TRUE)



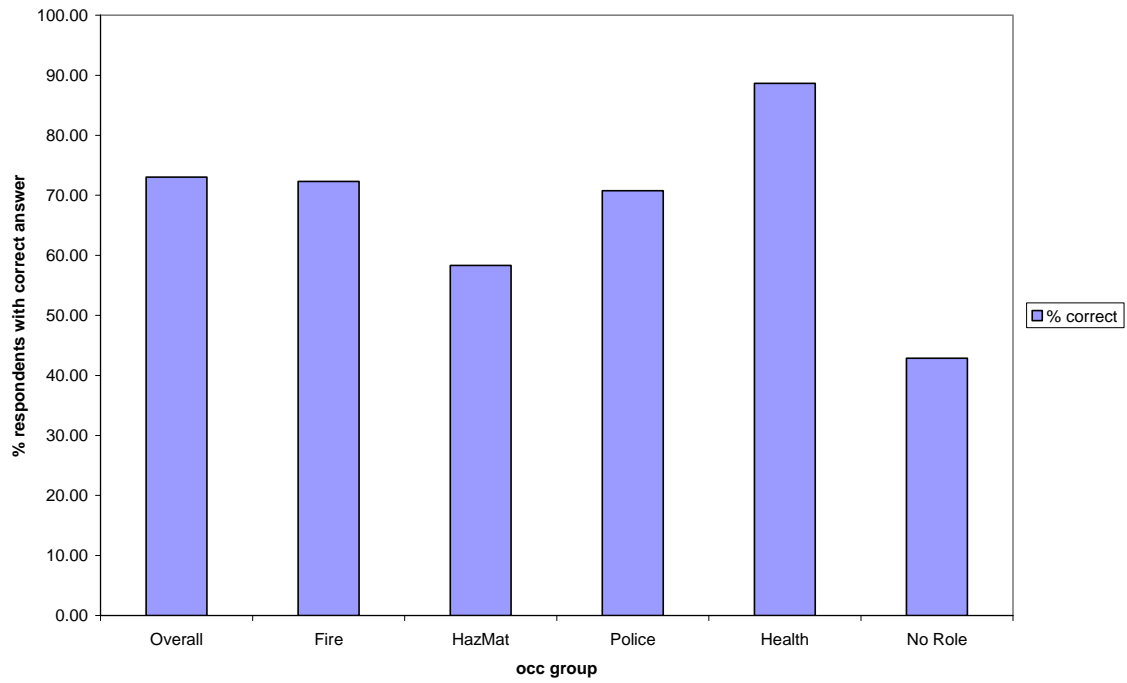
Q17 - Persons allergic to iodine can safely take a KI pill. (correct answer is FALSE)



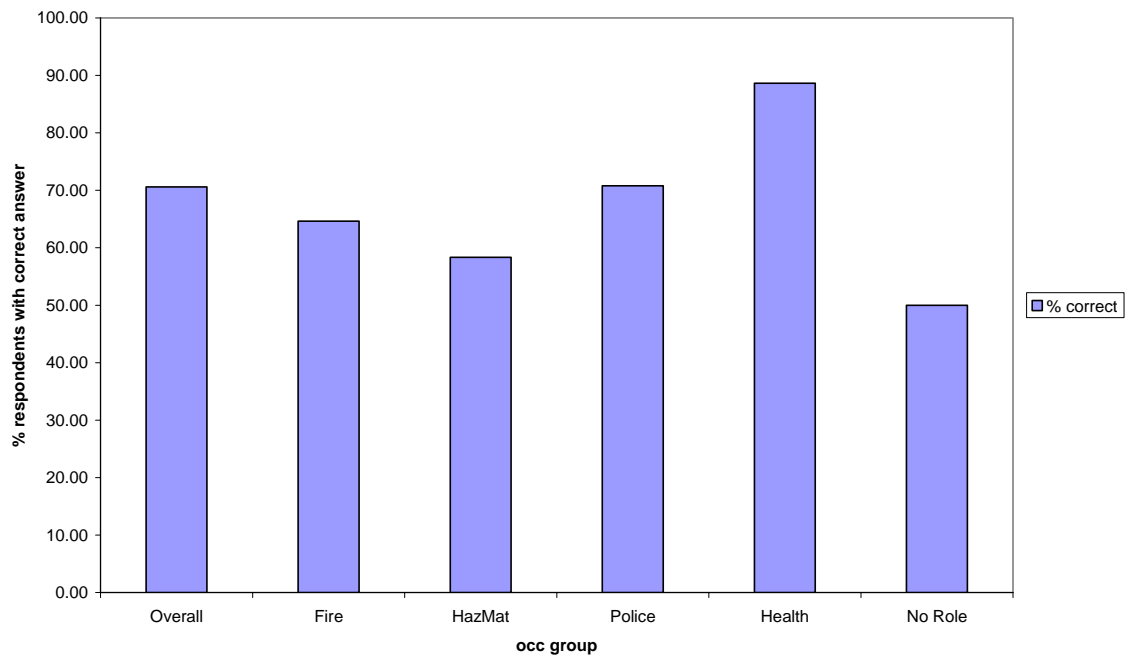
Q18 - In general, persons above the age of 40 should take KI if they are exposed to a small amount of radioactive iodine. (correct answer is FALSE)



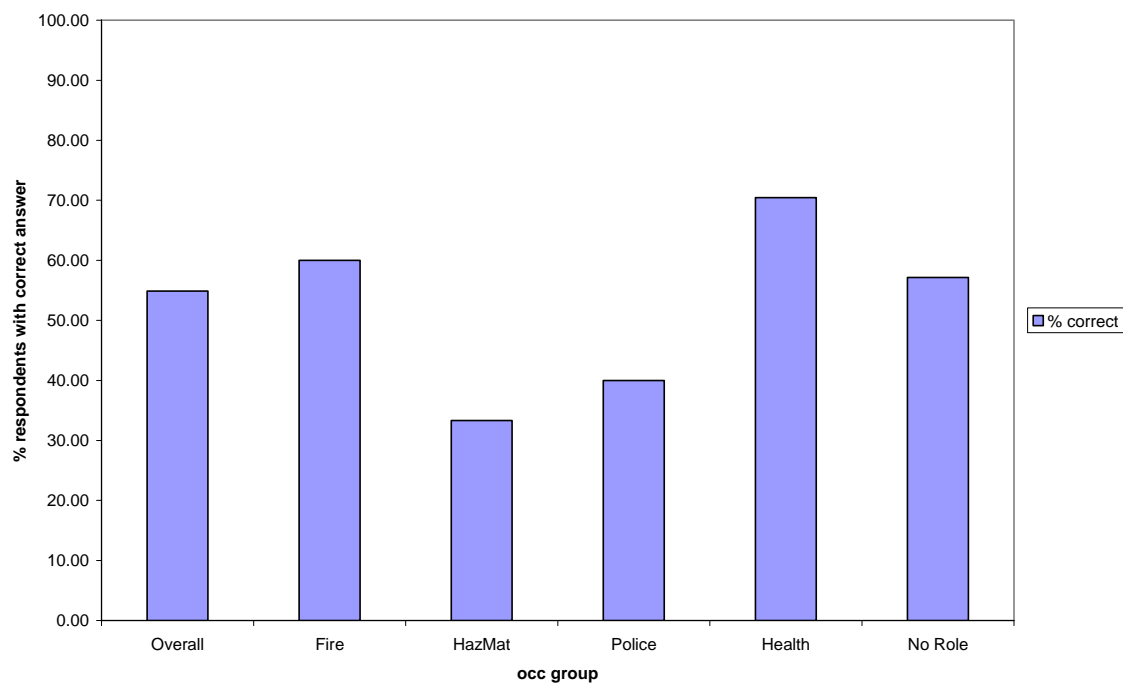
Q19 - KI pills or tablets protect "....." (correct answer is the Thyroid only)



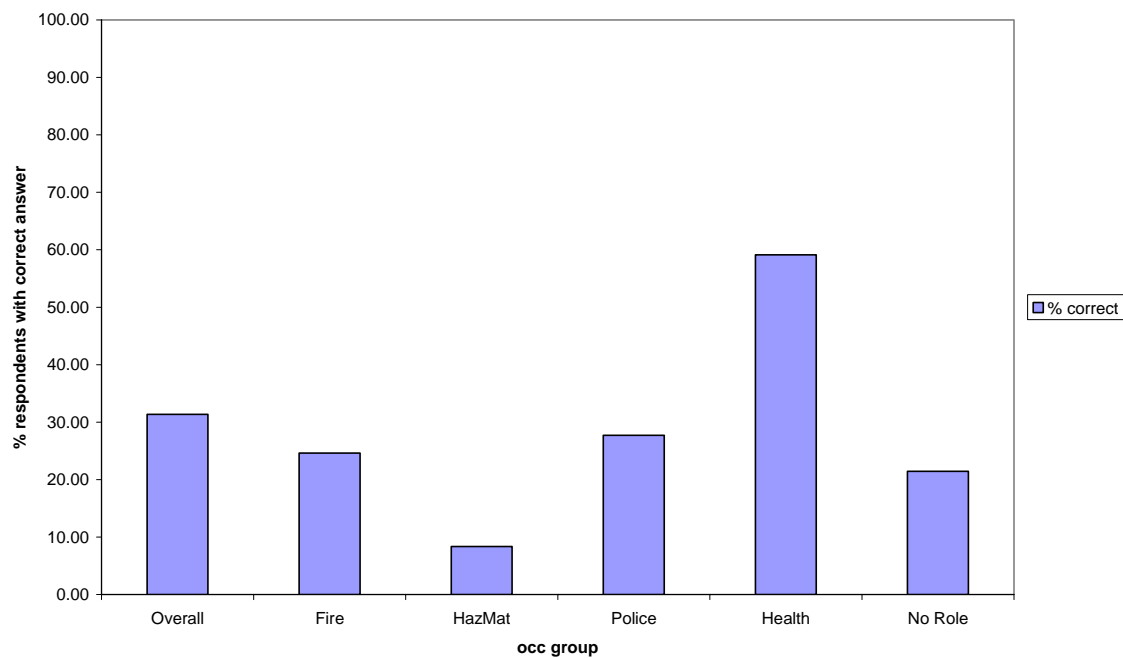
Q20 - When should someone take their first does of a KI pill or tablet? (correct answer is "within hours of exposure")



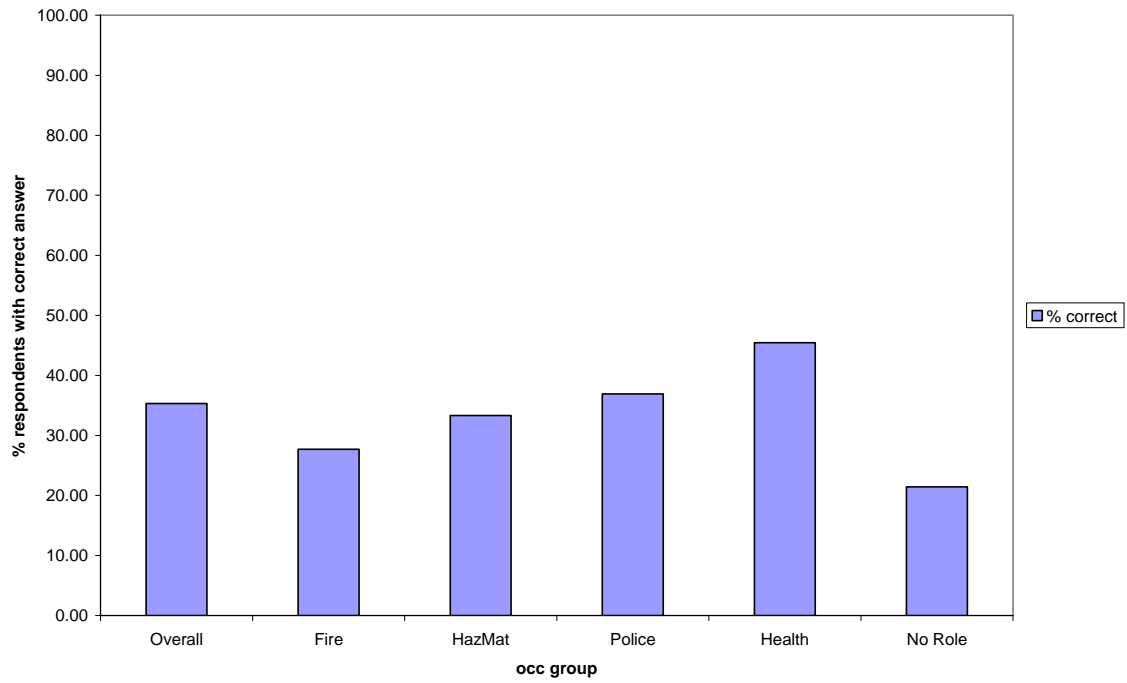
Q21 - What is the recommended KI dose for adults? (correct answer is "one full tablet")



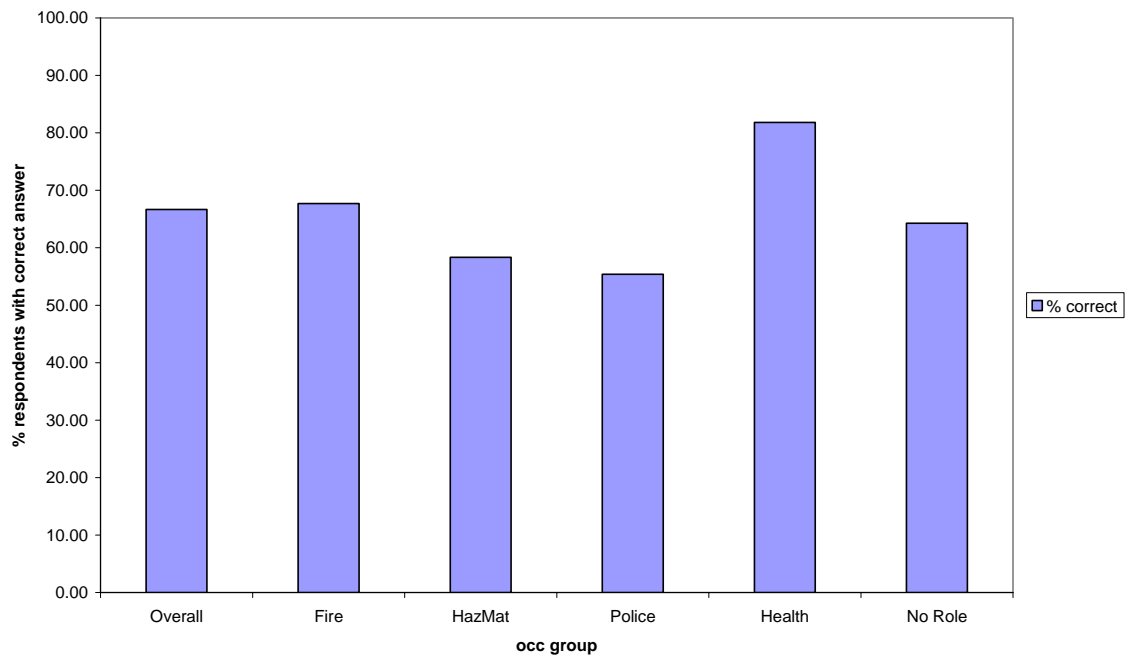
Q22 - What is the recommended KI dose for children over 3 years of old? (correct answer is "half adult dose")



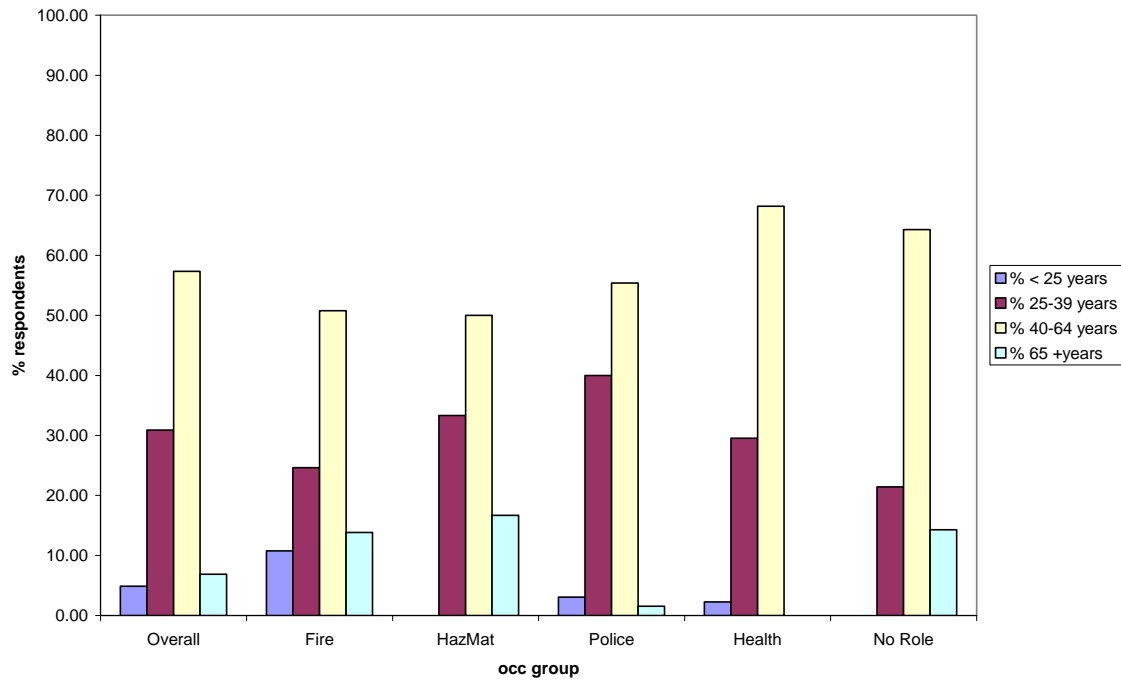
Q23 - How long does effective protection last? (correct answer is "24 hours")



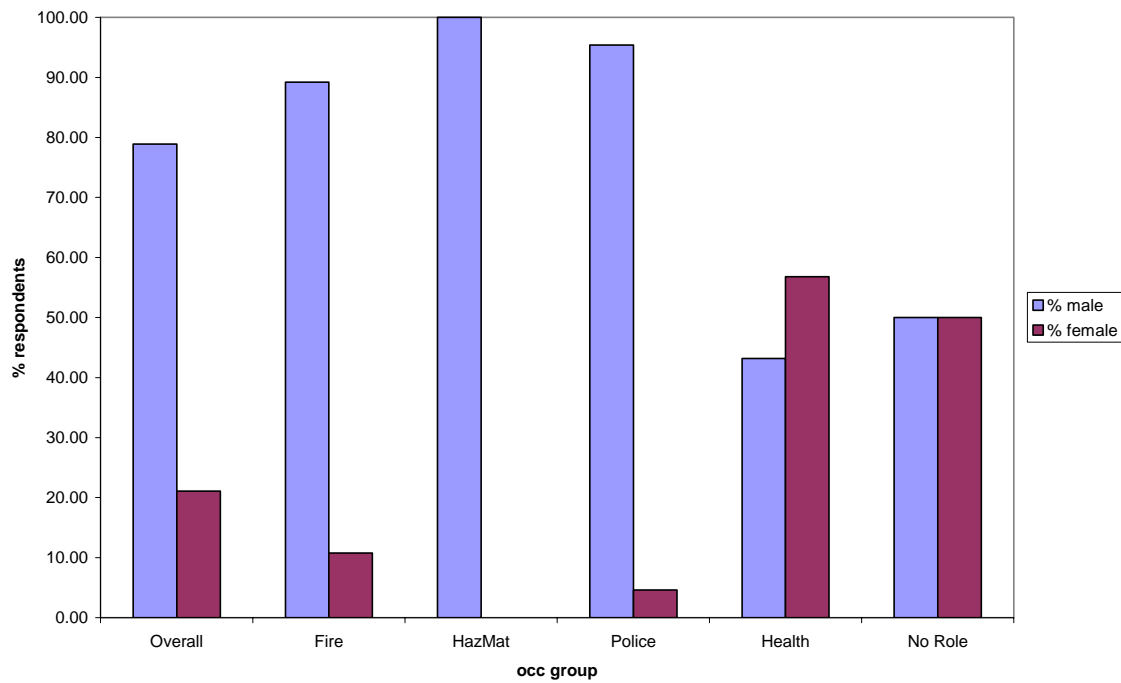
Q24 - Would taking several doses of KI at one time provide more immediate protection then just one does? (correct answer is NO)



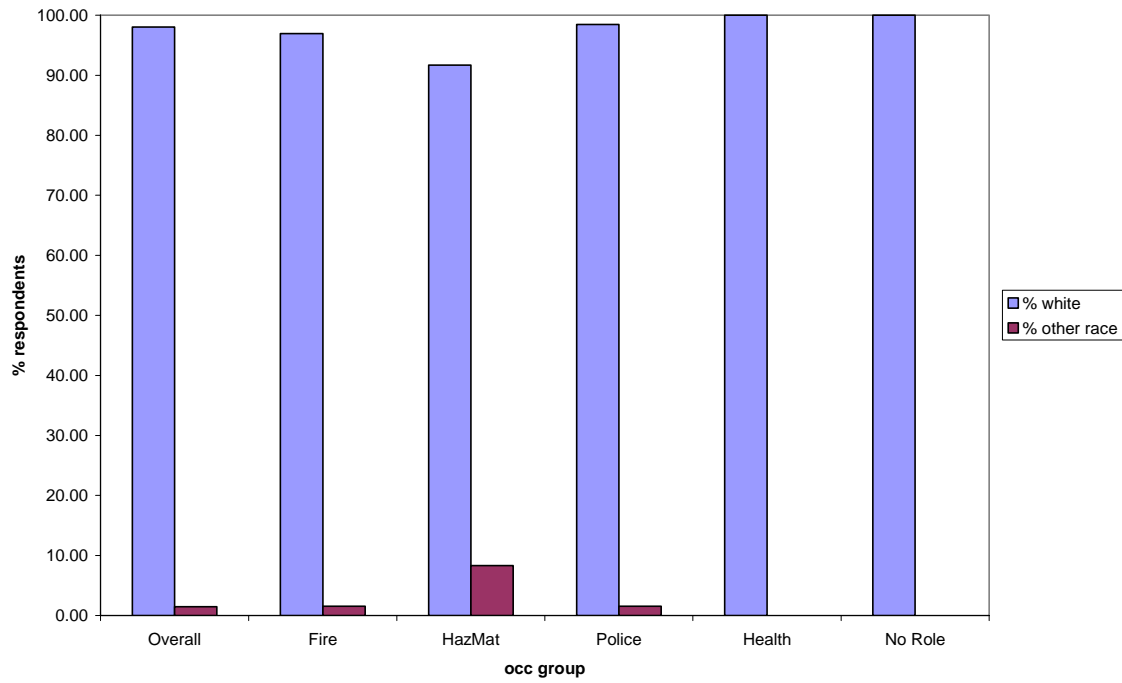
Q25 - What is your age?



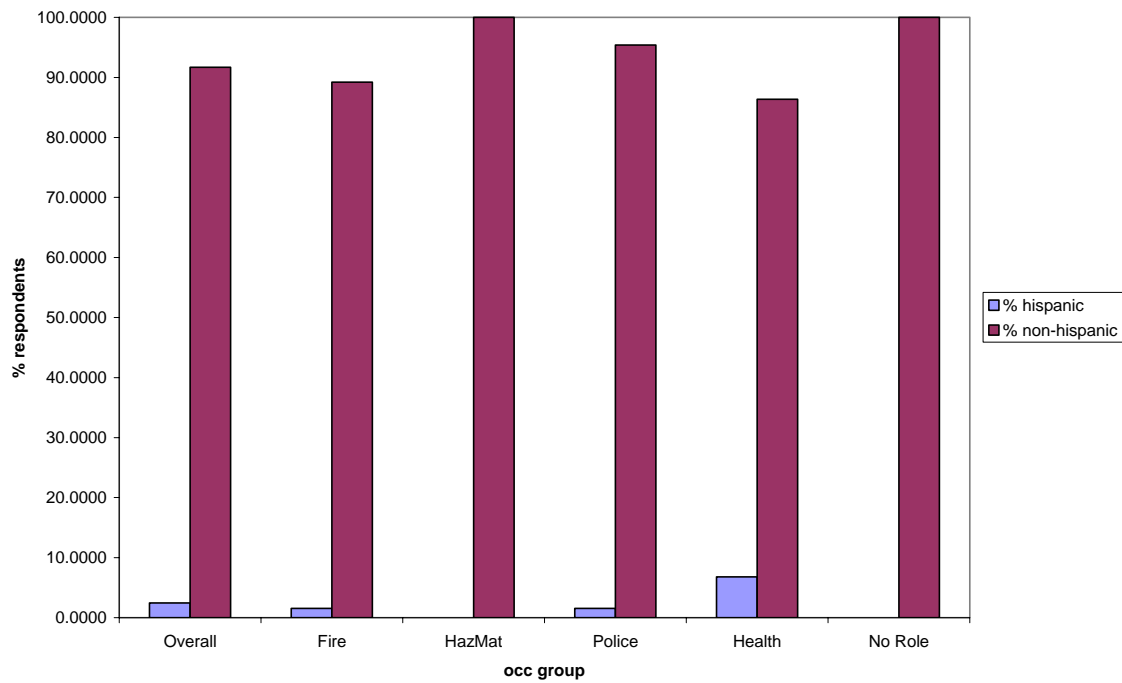
Q26 What is your gender?



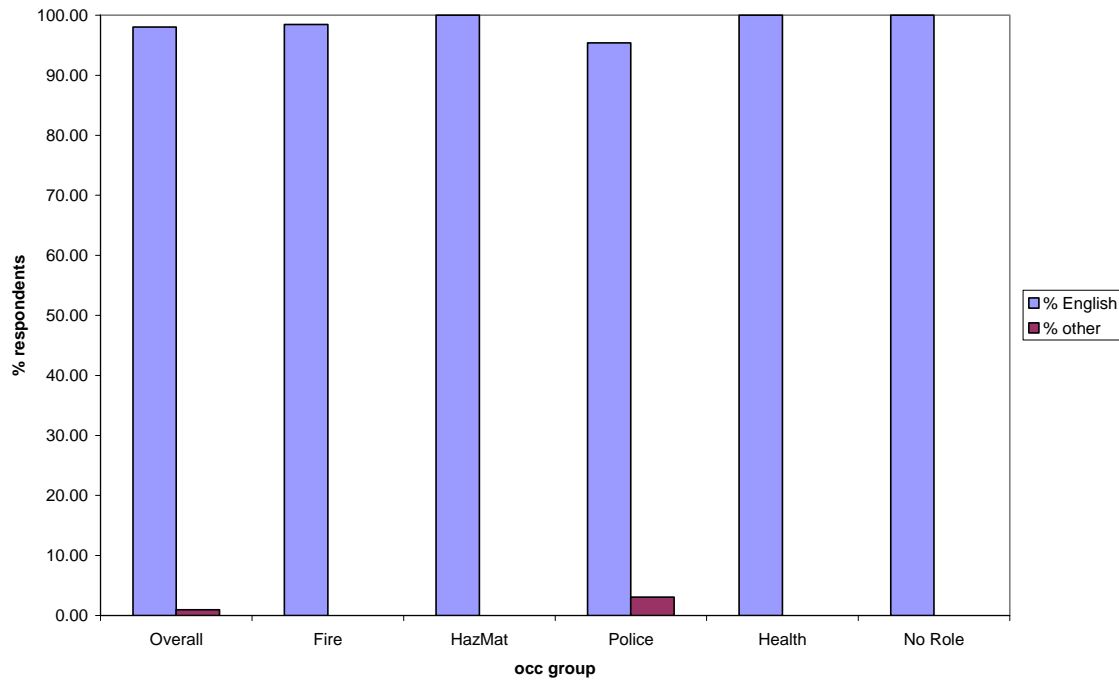
Q27 What is your race?



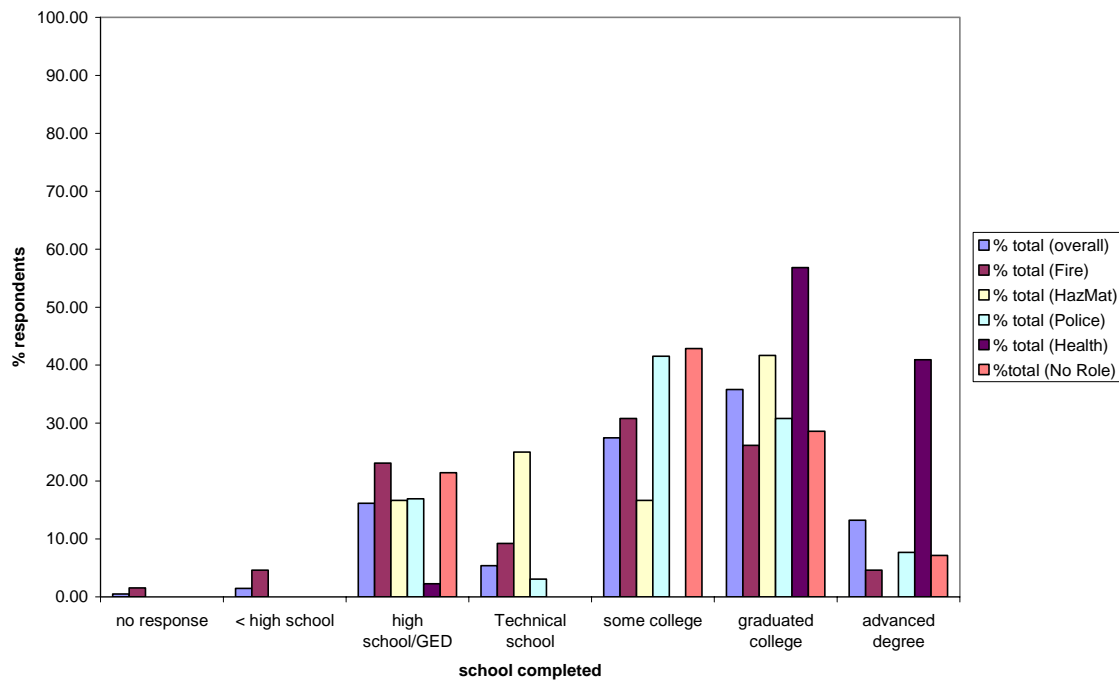
Q28 What is your ethnic background?



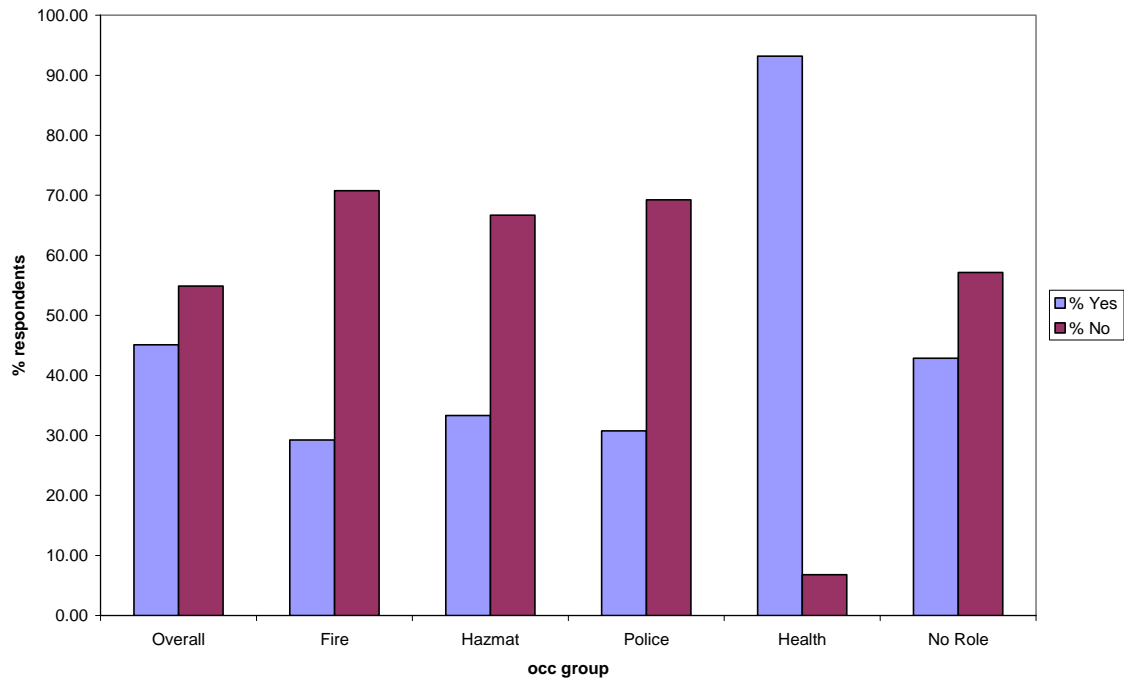
Q30 What is the primary language you speak at home?



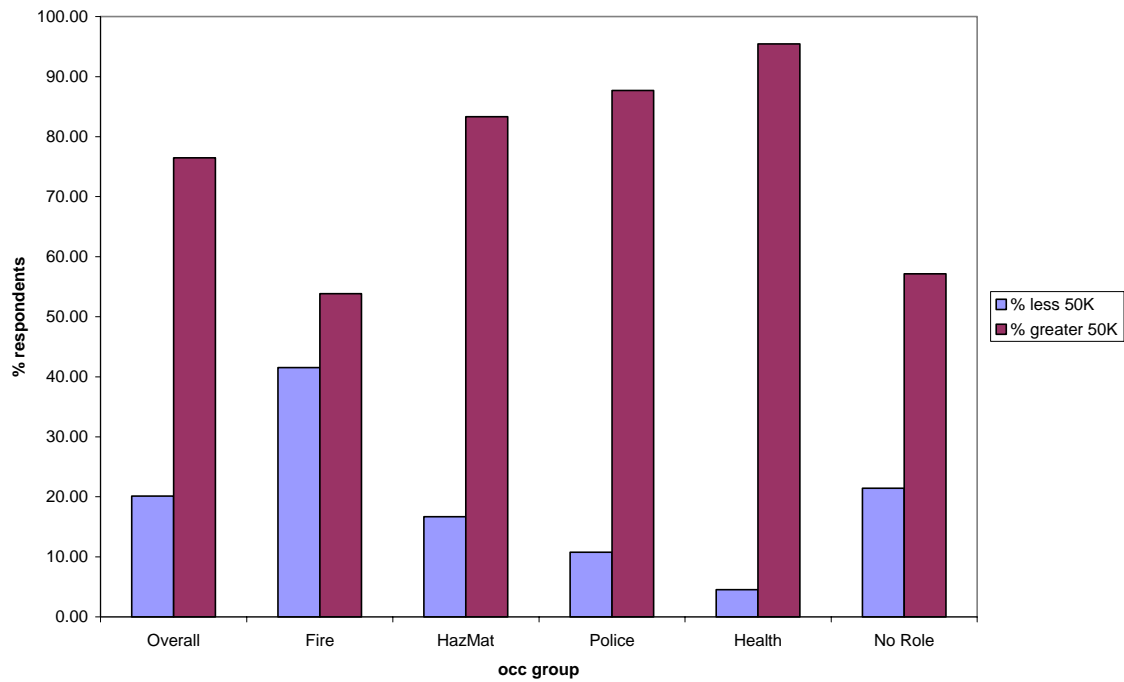
Q29 How much school have you completed?



Q2 - Have you completed college level classes in engineering or science?



Q31 Approximately what is your household income bracket?



Appendix E
Comprehensive Literature Review and Citations

Accidents at nuclear reactor facilities have occurred over the last several decades, with some accidents resulting in releases of large quantities of radioactive noble gases, iodines, and other isotopes. Isotopes of iodine are of particular interest because both experience with accidents and reactor inventories suggest that along with noble gases these isotopes would have the potential to be released in the largest quantities. The accidents at Windscale (now called Sellafield) in 1957, Three Mile Island in 1979, Chernobyl in 1986, and Sosnovy Bor in 1992 resulted in releases of radioactive iodine (National Research Council, 2004). The accident at Windscale released 20,000 Ci (Curies) of radioactive iodine, 340,000 Ci of radioactive noble gases, 1600 Ci of radioactive tellurium, 600 Ci of cesium-137, and 89 Ci of strontium-89 and strontium-90 (Crocker, D. 1984). The accident at Three Mile Island released 10 MegaCuries (MCi) of noble gases but only 17 Ci of radioactive iodines (Crocker D. 1984) while the accident at Chernobyl released many fission products including an estimated 36 - 46 MCi of radioactive iodines (Nauman and Wolff, 1993). Radioactive iodine was released in all three of these major accidents despite the differences in reactor design and the causes of the accidents. The need for effective emergency response plans and countermeasures has become apparent as a result of these experiences.

Exposure to radioactive iodine isotopes has been associated with adverse health outcomes. Evidence has suggested that native populations in the South Pacific exposed during the nuclear bomb tests in 1954 had elevated rates of thyroid cancer and thyroid abnormalities as documented in 1969 (National Research Council, 2004; Conrad et al. 1970) and that there has been a significant increase in the incidence of thyroid cancer among children and adolescents in Belarus, the Ukraine, and Russia after the Chernobyl accident (Verger et al. 2001). Conversely, studies of thyroid cancer among adult patients irradiated during medical treatments (Verger et al. 2001) or adults dosed with radioactive iodine during diagnostic procedures or medical treatments (Yalow, R. 1982) have not demonstrated an increase risk of thyroid cancer in these adult populations. This may be the result of different sensitivity to radioiodine exposure among children versus adults, more carefully controlled dosing and management in medical settings, or this may be an artifact of the study design in these epidemiological studies.

The use of potassium iodide or iodate (KI or KIO) has been demonstrated as an effective thyroid blocking agent provided it is used properly. The dose and the timing of the administration of KI are crucial parameters in determining the level of protection achieved. KI must be taken roughly within several hours before or within one hour after exposure to radioiodine to avoid greater than 90% of the radioiodine dose (Verger et al. 2001, Nauman and Wolff, 1993). The blockage of radioiodine uptake from a single dose remains high for approximately 24 hours and then begins to decrease significantly, which has led to the development of a repeat dosing scheme with the daily adult administration of a smaller amount of KI for the maintenance of high thyroid protection over extended periods of time (Verger et al. 2001) not to exceed 7 to 14 days (Becker et al. 1984). Many of these dosing schemes attempt to limit the probability of an adverse reaction resulting from the administration of KI. Nauman and Wolff (1993) found a low prevalence of medically significant adverse side effects during the use of KI in eastern Poland immediately after the Chernobyl accident, where 10.5 million doses were administered to children and 7 million doses to adults. The most common minor side

effects reported were vomiting among children, likely due to the taste and odor of the KI preparation, and minor skin rashes among both children and adults. Detectable hypothyroidism was found in 0.37% (n=12) of a sample population of infants born to mothers who received KI prophylaxis during the second half of pregnancy, which may have resulted from the concentration of iodine that occurs in the fetal thyroid after 12 weeks of gestation (Nauman and Wolff, 1993). This was possibly a significant adverse reaction and therefore, as recommended by the World Health Organization, requires that any pregnancy beyond 12 weeks of gestation at the time of KI prophylaxis be carefully monitored to detect and address fetal or newborn hypothyroidism should it occur (Verger et al. 2001). Despite this finding, the fetal thyroid is sensitive to radioiodine exposure and therefore makes KI prophylaxis important for the protection of this population. In addition, Nauman and Wolff (1993) reported two severe reactions requiring hospitalization among patients who took KI despite their known iodine sensitivity and that an estimated 6% of the adult prophylaxis taken was panic driven self administration before the official order from the Polish government.

KI distribution has been a subject of debate and regulatory review in the United States since 1972 (Becker and Zanzonico, 1997). Flynn (1981) summarized the experience of the Three Mile Island (TMI) accident. In the United States, Fowinkle et al. (1983) found that approximately 66% of homes within 5 miles of Sequoyah nuclear power facility were willing to accept KI pills distributed directly to their homes through door-to-door visits by the local health departments. The local health department expended 166 person days to distribute KI and the associated educational fact sheets and information to 3,022 homes (Fowinkle et al. 1983). Drills also demonstrated in this area that distribution of KI pills to residents during a simulated emergency was too slow to provide the public with adequate protection (Fowinkle et al. 1983). Winder et al. (1994) found in a general nuclear safety and emergency response survey of local health departments within 60 miles of nuclear power plants that there was a wide range of knowledge levels regarding nuclear safety among public health professionals. Winder et al. (1994) found that on average about 50% of knowledge based questions could be answered correctly and that 65% of local health department directors were not in favor of their department having any radiological emergency response role, and that some directors did not consider radiological response a priority. The survey conducted by Winder et al. (1994) showing the lack of awareness and lack of desire among public health departments to be involved emphasizes the finding from the President's Commission to investigate the TMI accident that clear lines of authority must be defined prior to an emergency to assure an efficient, timely, and effective radiological response (Fowinkle et al. 1983).

In Europe, the subject of KI and nuclear emergency preparedness has also been debated among various governments, especially since Chernobyl. Nauman and Wolff (1993) detail the Polish government experience and policy debate in eastern Poland during Chernobyl. The French government has also evaluated their KI distribution programs and KI prophylaxis has been the subject of policy debate among the French government. Le Guen et al. (2002) noted a significant decrease in attendance at local emergency response meetings sponsored by the French government from 1997 through 2000 and found variable KI distribution coverage rates, with 60 - 70% of KI vouchers redeemed at the local pharmacy in 1997 versus only 43% during the 2000 KI distribution

campaign. Millership (1998) found in a survey of 14 emergency districts in Great Britain that 8 distributed pills to a centralized local distribution site, three distributed pills directly to homes, one district had no emergency response plan, and two districts failed to provide information on the survey. Many of these districts did not explicitly address the KI needs for emergency responders, experienced communication and logistic problems when interacting with law enforcement, and the results of drills had shown that distribution of pills during a emergency event is impractical as centers could only deliver KI pills to approximately 100 homes per hour, process 66 people per hour at a local KI distribution clinic, and could only decontaminate approximately 33 people per hour (Millership, S. 1998). Astbury et al. (1999) demonstrated two years after a KI pill distribution campaign in Great Britain that approximately 60% of KI pill recipients could retrieve and show inspectors their supply of pills and that better retention of pills was achieved among small homes without children.

The New Jersey Department of Health and Senior Services (NJDHSS) and local health departments offered KI pills to interested people who resided or worked within the Emergency Planning Zones (EPZs) of either Salem or Oyster Creek nuclear sites. These two sites together have a total of four reactors, with Salem 1, Salem 2, and Hope Creek unit 1 reactors located in Salem County New Jersey and Oyster Creek unit 1 located in Forked River New Jersey. The NJDHSS and local health departments pre-distributed KI pills in the summer of 2002 by holding six open clinics at local sites, such as schools, where interested persons could come to obtain free KI pills. Clinic attendees were then given one pill for each person in their household. The assessment presented in Blando et al. (2006a), Blando et al. (2006b), and Blando et al. (2006c) this paper is an evaluation of emergency response plans and the method of KI tablet distribution among a large population of residents living near Oyster Creek and Salem nuclear generating stations in New Jersey. These studies also evaluated the knowledge and beliefs among emergency responders responsible for the EPZ areas around these two plants. Uniquely, these two nuclear power facilities are among the handful of facilities that operate within very densely populated areas, further underscoring the importance and challenges of effective emergency response in these areas.

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